The Builder.

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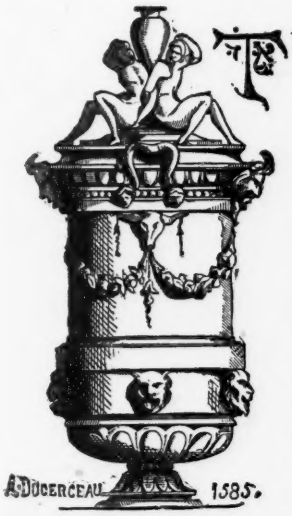
Thomas Brassey.



THE death of Mr. Brassey, which occurred on the 8th of December, is an event not to be dismissed with the ordinary commonplaces of obituary notice. The great wealth which his energy and sagacity enabled him to acquire may be said to constitute the least of Mr. Brassey's claims to posthumous respect. His life was one marked by unstinted industry, by unspotted integrity, by capacity of a high order, and by a kindly and benevolent spirit. Engineering works of unprecedented magnitude were carried out, by the admirable organisation which he instituted, in almost every quarter of the world. His life was spent to the benefit of his country, and his name will never be forgotten in the future records of the triumphs of genius and of perseverance.

Thomas Brassey was born on the 7th of November, 1805, at Baerton, near Chester. His father, John Brassey, of Bulkeley, farmed his own patrimonial estate, and traced his name to a Norman origin; a De Bracey, or De Brassis, having been one of the noble cadets who followed the fortunes of William Duke of Normandy. Taken, at the age of sixteen, from school at Chester, Thomas Brassey was articled to a surveyor in that quaint old city; by whom, on the termination of his apprenticeship, he was taken into partnership. The professional occupation thus afforded constituted a practical education of the utmost value, as introductory to a career of a character absolutely unprecedented. Young Brassey was engaged, among other surveys, on that of the road from Machynlleth to Aberdovey, which runs along the valley of the Dovey. In the skill and experience which his assiduous attention to this duty enabled him to acquire, Mr. Brassey laid the foundation of his future eminence. He undertook, shortly after his marriage, the entire responsibility of the business previously carried on by the firm of Lawton & Brassey; and added industrial enterprise to the professional labours of a surveyor, by the establishment of lime-kilns and of brick-yards, and by the execution of a road from Tranmere to Brownborough. It thus befell that when, in 1835, Mr. Joseph Locke, then just appointed engineer of the Grand Junction Railway (from Liverpool to Birmingham) was looking out for competent contractors to execute the works, Mr. Brassey was admirably prepared to fulfil such a task. He undertook a length of ten miles of that line, known as the Stafford Contract, and carried out his engagement at the same time to his own pecuniary benefit and to the complete satisfaction of the engineer.

The directors of the London and Southampton Railway, becoming embarrassed with the difficulties of their undertaking, called in Mr. Locke as engineer, who at once entrusted the completion of the works to Mr. Brassey; the amount of the contracts thus entered into exceeding four millions sterling. While employing as many as 3,000 men in the South-western district, the enterprising contractor undertook portions of the Chester and Crewe, and of the Manchester and Sheffield Railways; and, in partnership with Mr. W. Mackenzie, the execution of the Glasgow and Greenock line.

In 1840, Sir John Easthope, and other directors of the South-Western Railway, formed, together with M. Lafitte and a few French capitalists, a company for the construction of a railway from Paris to Rouen. Mr. Locke, naturally, was named engineer; and Messrs. Brassey & Mackenzie were entrusted by him with the execution of the works. The prolongation of the line to Rouen (after Mr. Robert Stephenson, with a delicacy which did him honour, had declined to undertake it as engineer, on the ground that Mr. Locke might think he had a prior claim to the post) was carried out under arrangements similar to those for the Paris and Rouen line. Between 1844 and 1848 Messrs. Brassey & Mackenzie contracted for five other French railways; and the former also undertook, in whole or in part, the works for three lines in Scotland, and two lines in England and Wales. At this time the industrial army set in motion and controlled by Mr. Brassey amounted to 75,000 men; and his weekly payments must have distributed, as the price of labour, from 15,000*l.* to 20,000*l.* every Saturday. The capital involved in these various contracts amounted to some 36,000,000*l.* sterling.

The Great Northern Railway, the last of this series of contracts, was completed in 1851. In the same year Mr. Brassey commenced works in Shropshire, in Somersetshire, and in the county of Inverness. In 1852 he undertook, in Belgium, in Holland, in Prussia, in Spain, and in Italy, the several lines of the Sambre and Meuse, the Dutch Rhenish, the Barcelona and Mataro, and the Maria Antonia Railways. In partnership with Messrs. Peto & Betts, Mr. Brassey constructed the Grand Trunk Railway of Canada, a line upwards of 1,100 miles long, which crosses the St. Lawrence by the largest and most expensive bridge which has yet been anywhere erected. Between 1853 and 1857 he constructed six more railways in France, as many in Italy, and the very difficult Bilbao and Miranda line in Spain. He further undertook contracts in Norway, Sweden, Denmark, and Switzerland. He constructed and maintained (at a considerable loss, it may be added) the temporary Railway over the Mont Cenis Pass of the Alps, a line which the approaching opening of the tunnel under that great natural barrier will shortly supersede. In Turkey he undertook contracts which are still in course of execution. In Austria he received distinguished testimony to the value of his exertions. In India he constructed the greater part of the East India Railway, the Calcutta and South-Eastern, and other works. In Australia he constructed several hundred miles of railway. He contracted for the first railways projected in South America; and one of his last undertakings was a contract for docks at Callao, amounting to more than half a million sterling, which has to be carried out by his executors. It would occupy unnecessary space to give the names of thirty-one English and Welsh railways, which, during the period in question he was making, extending, or widening. The Barrow Docks and the important Runcorn Viaduct must not be omitted from a summary of his most important enterprises. The subsidiary or private undertakings, by means of which he constructed his enormous plant, and ministered to his home and foreign contracts, were in themselves enough to overpower the capacity of any ordinary man. Coal-mines, iron works, dockyards, the great establishment on the margin of Wallasey Pool at Birkenhead, "Canada Works," where the Victoria Bridge for the St. Lawrence was constructed, all owed their existence to his energy. The railway contracts executed by Mr. Brassey and his various partners, from 1848 to 1861, extended over 2,374 miles, and amounted to a total value of 28,000,000*l.*

The patient sagacity and calm resolution to abide by the rules he had laid down for his own conduct, which enabled Mr. Brassey thus to perform, at the same time, an amount of work equal to that of three or four Ministers of Public Works put together, may be illustrated by an anecdote never until now put forth.

In the year 1862 Mr. Brassey was in Turin. Some Italian notables of that day called upon him, at the Hotel Trombetta, in order to obtain his support for one of the great enterprises by which it was then sought to enrich the Peninsula. Mr. Brassey was conversing with an English engineer (who had himself been served by an Italian Government much as a captive kite is served by the gamekeeper, who suspends him as a terror to other predatory birds), when the deputation arrived,—a lawyer of eminence, a member of the administration, more than one deputy of the Chamber. Ensconcing his companion in the inmost chamber of the suite, where every word that passed was distinctly heard, and where he was asked to wait for half an hour, Mr. Brassey received his visitors. Nothing could be more apparently satisfactory than the commencement of the interview. The advantage of the project was set forth by the projectors, and admitted by Mr. Brassey, whose brief occasional remarks showed that he had thoroughly mastered the subject. When the whole matter had been presented in its fairest light, by one and another of its advocates, Mr. Brassey remarked that it might save time if he explained the invariable principles on which he conducted business. He was willing to afford a large measure of support to any enterprise of which he undertook the works. He was prepared, in such case, to subscribe to the capital, and to hold, without forcing on the market, a certain proportion of shares, or bonds, or both. But such financial arrangements must be entirely distinct from those made for the execution of the works. For that he must receive monthly payment in cash, according to regular monthly certificates by the engineer, of from 80 to 90 per cent. of the value of work done. If the directors were prepared to deal on these terms, he should be ready to enter at once into the details of prices.

The deputation were delighted. Nothing could be more to the point, or more in accordance with their ideas of business and habits of action. Then they commenced a review of the features of the scheme, and travelled, a second time, over the ground already covered, rising, however, in enthusiasm as they dwelt on the unrivalled advantages which the shareholders would enjoy. They considered the contract as settled with Mr. Brassey. The terms were fully acceptable to both sides, and they would send their engineer to meet Mr. Brassey's engineer, and settle the details of the schedule, as to which no difficulty could arise, as there were ample precedents to follow. They would take their leave of their honoured friend with the utmost content. The little noise which accompanied the rising of half a dozen persons succeeded. The door opened, and, just in backing out, "Of course," said the first speaker, "Mr. Brassey had no objection to accept, as cash, the shares of the Company for which he had promised to subscribe!"

"Stop, gentlemen," said Mr. Brassey. "I am sorry that I have failed to explain my meaning. You must not go away under a mistake. I told you, that, if we agreed to the details, I would subscribe for a certain proportion of shares.

But I told you that this must be kept quite distinct from the monthly payments. They must be regularly made in cash, to my bankers; on no other consideration will I look at the business. I have large sums to pay every month, and I cannot allow any uncertainty to subsist as to the regularity of my receipts. Pray understand that. It is a *sine qud non*."

"Of course, if Mr. Brassey put it in that way, the directors would be delighted to meet his views. They had merely intended to avoid trouble, by proposing one transaction instead of two. But it was for Mr. Brassey to decide." Then followed a second repetition of the entire argument, to which Mr. Brassey listened with great patience. Again, the leave-taking process was gone through; and, again, as if a mere casual remark,—"The directors understood that the company's obligations were equivalent to cash, as, in point of fact, they were at 3 per cent. premium, and therefore worth more than bank notes."

"In that case," Mr. Brassey rejoined, "it would be easy for the company to convert them, and to pay him in money. He did not wish for more than his price. The advantages to be derived from the premium on the obligations might be very large. So much the better for the company, but he had explained his own invariable system."

It would be intolerably tedious to attempt a more detailed account of the entire conversation. In a word, the half-hour for which Mr. Brassey had imprisoned his countryman, lasted from a quarter to six till nearly ten p.m., when the deputation at length retired, making arrangements for a second interview. The Italians were thoroughly beaten and tired out with their own efforts. They had not made an inch of way. The regular payment insisted on by the Englishman they had never dreamed of really making. They brought their fullest experience of legal and Parliamentary tactics to bear on the unaided common sense of the great contractor, whom they endeavoured to use; and they came to grief against his clearsighted honesty. He never undertook their contract.

The systematic and orderly execution of works, to so vast an amount as those undertaken by Mr. Brassey, brought in, even at the moderate rate of calculated profit, wealth that was counted in millions. It is not to be supposed, however, that no reverses occurred. Never elated by his unrivalled prosperity, Mr. Brassey met loss with composure, and, what is more rare, without attempting to throw it upon others. In 1846, the Barentin Viaduct, on the Rouen and Havre Railway, 100 ft. high, and consisting of twenty-seven arches of 50 ft. span, fell like a house of cards. The responsibility of a failure of this kind, the result either of faulty design, of slovenly execution, or of both combined, rests rightly on the engineer of the works. Mr. Brassey spared Mr. Locke any annoyance. He quietly rebuilt the great bridge at his own expense,—an expense of some 30,000*l*. The Grand Trunk Railway, again, conferred immense benefits on the Dominion, at the cost of those who found the money for the enterprise. The failure of Messrs. Peto & Betts was very costly to Mr. Brassey. For one line of railway, from the construction of which he had received no pecuniary advantage whatever, he had guaranteed a half-yearly interest, for a certain time, of 14,000*l*., which he had to pay. He had taken the wise precaution, at a time when the disasters of 1866 were altogether unlooked for, of placing a million sterling in the hands of trustees. It came out in the evidence on Messrs. Peto's bankruptcy that more than a third part of this provision against a rainy day had been lent to that firm. It is probable that Mr. Brassey lost, during the dark days of 1866, more than any other man of business could have lost,—of his own money, that is to say. Notwithstanding that reverse, he probably died a richer man than he had been at any earlier period.

Mr. Brassey's charity is said to have been as extensive as it was unobtrusive in its exercise, and well directed in its application. An unusual instance of largeness of heart was mentioned, about the time when it occurred, exclusively in the columns of the *Builder*. A little before Messrs. Peto & Betts's failure, Mr. Brassey, having become aware that the firm was hard pressed, called upon Sir Morton and offered, as simply as if it had been the most ordinary transaction, to lend him a hundred thousand pounds,—and not only so, but, with the aid of Mr. Lucas and two or three other friends, to raise the loan to half a million, if he received the assurance that that sum would entirely relieve the recipients from embarrassment. To the honour of all parties this generous offer was declined, on the ground that it would not be sufficient.

The nature of the relation which subsisted between the engineer of a public company and the contractors who undertook the execution of the works was, at the commencement of Mr. Brassey's career, very different from that which subsequently obtained. The early contractors were, for the most part, men of strong natural abilities, insight into the cost and method of executing work amounting to instinct, low tastes, violent habits, and grasping tenacity of purpose. A contract being once made, it seemed to be regarded as natural that the contractor should set his wits to work to make the most of it. This was to be done, on the one hand, by grinding his labourers under the pressure of the truck system and the "tommy shop," and on the other hand by "scamping" his work. Under the three grades of engineers ordinarily engaged ranked an array of inspectors. These were not men, like the *conducteurs des travaux* on the Continent, who discharged the drudgery of the engineer's work, took the levels, and set out the works. They were, purely and simply, men set to watch that the requisitions of the specifications were not eluded, that the mortar had the proper proportion of fresh lime, that bats were not used in place of bricks, that spruce was not substituted for larch in the fencing, and so on. Very frequently these men began by displaying extreme severity, greatly to the cost of the contractor. As a rule, vexatiously minute inspectors were open to bribes. They gave trouble unless they were bought off. This matter once arranged, the less scrupulous contractors and sub-contractors often drove a roaring trade, the engineer being sold by his own watchmen.

Against this system of scamping and of bribery Mr. Brassey was one of the first to make a stand. In all questions that he was called on to decide, he had the wholesome habit of inquiring "how the thing would look if it came before twelve men in a box." The time-honoured institution of the jury was ever present to his imagination, and it may be questioned whether that English method of arriving at justice was ever more useful than in this anticipatory appeal to its possible result. Bribing and scamping being thus discarded, Mr. Brassey adopted a method of his own of dealing with that natural enemy (as some regarded him) of his class,—the engineer. It was his plan,—using an expression now perhaps forgotten,—to "smother the engineer." This smothering, however, consisted only in extinguishing all just causes of complaint. To do his work fairly and faithfully, to render inspection superfluous, and thus to annihilate the power of the inspectors, was the system which led to the attainment of such a character of reliability for the performance of work as proved to be one main element of Mr. Brassey's extraordinary success.

With a man of this nature, the relations of an engineer soon became more confidential than was at all ordinary in the early days of English railway work. Establishing his character by the first contracts which he executed under Mr. Locke on the Grand Junction Railway, we have seen how Mr. Brassey subsequently accompanied that engineer to the South-Western line, to Normandy, and to other districts. The influence of that engineer was enormously increased by the practical backing thus afforded. An estimate by Mr. Locke meant a price at which Mr. Brassey would tender. In some instances, indeed, the support thus given to what was no longer mere scientific opinion, rendered Mr. Locke rather a dangerous adviser for his brother engineers to call in. On one considerable line of railway, as to which, in 1837, there was a question of prosecution or abandonment, the engineer appealed to Mr. Locke to support estimates which afterwards proved to be grossly inadequate. The report took the form of condemning the details of the estimate, but intimated that for the gross sum contractors might be found to execute a well-devised line between the points. The engineer in question narrowly escaped having to pay a very heavy price for the support which he thus invoked. At no part, however, of Mr. Brassey's career has he been accused of endeavouring to take the bread and cheese out of a brother contractor's mouth.

The modest taste of Mr. Brassey led him to shun distinctions which many other men so anxiously seek. He wisely declined to waste his well-employed time by entering the House of Commons. The Government of France acknowledged his services in constructing the railways of that country by the Cross of the Legion of Honour. The King of Italy evinced his sense of the value of Mr. Brassey's labour in that country by sending him the Cross of the Order of St. Maurice and St. Lazarus. The Austrian Emperor bestowed on him the rare distinction of the Order of the Iron Crown, a decoration never, it is said, before conferred on a foreign subject. Mr. Brassey probably valued still more highly the testimonial presented to him, in 1851, as an expression of gratitude, by his numerous agents, sub-contractors, and tradesmen, which cost the handsome sum of 10,000*l*. No English Minister honoured himself by commemorating the great services rendered by Mr. Brassey to his country. As he was only a great industrial benefactor, and not a political partisan or agitator, he was left to the rarer distinction of the respect of all good men. The hereditary Order of Knighthood, which owes its origin to the exigencies of the House of Stuart, would have been illustrated by the association of a name that was known wherever industry was active or English spoken But it would be out of place to expect a Cabinet Minister of the present day to waste honours, that might be useful to secure political support, on an independent and non-political man, merely because he was such a one as deserved any distinction that his Sovereign could bestow.

Mr. Brassey has been spoken of, in what we fear must be called the fashionable cant of the day, as a representative man. Nothing can be farther from the truth. It would, indeed, be a happy thing for the country and for the age if the expression were correct. On the contrary, Mr. Brassey rose to the unquestioned leadership of his calling by the possession and the exercise of qualities which are not only, in the degree in which he possessed them, rare in themselves, but which are still more rare in combination. His character presented a happy equilibrium between forces of opposite tendency. He was remarkably keen and sagacious in perceiving and in maintaining his own interest, at the same time that he was unimpeachably just with regard to the interest of others. He was eminently kind-hearted, at the same time that he was quite deaf to the voice of wheedling. He undertook, and carried out, not a few large operations, rather for the sake of the employment of his dependents than for his own emolument; and he largely increased his wealth by so doing. He was bold to audacity in the magnitude of his operations, at the same time that he was cautious, even to timidity, in the preliminary investigation of details. Fully conversant only with the English language, and making no pretension to a critical acquaintance with that, he not only so expressed himself as invariably to avoid misconstruction or confusion, but found himself almost as much at home in the principal Continental capitals as he did in London. Modest and unassuming in his manners, he was yet fully aware that he was an industrial power of the first magnitude. Liberal, on a large scale, in his dealings with the public companies for which he executed such wholesale works, he was exact to the utmost minuteness as to the regularity of certificate and of payment. He was at once generous and exact, energetic and calm. While ever to be found at the spot when his presence was required, he was free from that drive and bustle by which some persons endeavour to hurry their subordinates, and to obtain the reputation of men of business. Probably no man, in the history of the world, ever at once amassed and deserved so much wealth. He never, it has been said, lost a friend, and never made an enemy. He has left his country the witness of a well-spent life, a life not less memorable for the number and magnitude of his gigantic works than for the worth and excellence of both his public and his private character.

ON THE SELECTION OF BUILDING SITES.*

BUILDINGS are, of course, constructed on all kinds of sites; but for many reasons modern towns generally occupy valleys, and are thus distinctly contrasted with towns of other days, which were much more commonly, and for equally good reasons, perched on eminences. Valleys now traversed by rivers are far more convenient than plateaus, as more accessible

* From a paper by Professor Ansted, F.R.S., read at the Royal Institute of British Architects on the 9th inst.

both by land and water, and if less safe in a military sense than plains in some respects, they are much more so in others. But whatever the reason, it is a fact that all important and large cities are on or very near large rivers. Thus the condition of the rocks on the surface of valleys has important significance.

It may be assumed, in the present state of geological science, that all such open valleys as now form or contain the beds of rivers have been reduced to their present shape, and have derived their present condition, from the passage of water through them. The beds or bottoms of the valleys have been cut out by water, the transported material with which they are covered has been moved by water, the cliffs or slopes of the enclosing hills, at whatever distance, have been brought into their present state by weather action, and small as the stream may be that runs along a narrow channel in a winding course between these cliffs or slopes, it has been sufficient in the course of time to bring about the result we see before us. All that lies immediately beneath the surface in the valley often to a great depth consists of material removed very gradually by this water, while below that there is often another deposit of water-transported material, consisting of clay, stones, and sand, due perhaps to ancient glaciers, or left behind by icebergs that have floated over or have been stranded upon it when many fathoms below the sea level. Sometimes there are streams entering the main river from side valleys, and each of these again has formed its channel and left its mark. The more sluggish the main stream, and the further it is from its source, the greater in proportion is the effect of such feeders. When they are torrents they sweep all before them, and deposit large stones with smaller gravel, clay, and sand. When they have had a more even course, they deposit fewer large stones and more mud and sand.

From this account of the history of river deposits, given in a very few words and requiring to be varied in detail for every stream without exception, you may understand the nature of the material that you have to deal with in preparing foundations for a large and massive construction, in almost every part of England which such buildings are likely to be erected. The clay you find may be alluvial clay deposited by the stream, or it may be boulder clay left behind by ice. It may thin out at any point, and give place to gravel, to loose stones, or to fine sand. Beneath it may be a quicksand. A certain number of tons pressing on the square foot of surface may and will cause the clay to slip away from the sands, or the run of an open drain through such sands may, by removing them, remove all support. When in the bed of the main stream, there may be a very regular deposit of clay, capable of supporting any weight that could be put upon it, but the intervention of one of the old and forgotten tributaries may have cut away part of this clay for an interval, or prevented its formation, and thus one part of a building may be on a good clay and another part on loose shifting sands.

It is exceedingly important that the exact physical conditions of the formation of the alluvial beds of rivers should be clearly understood by practical men. It is by no means the case that the present bed of a river is the only part where loose and uncertain material exists, nor is it at all necessary to assume any change of level, still less any great convulsion of nature, to account for the phenomena. They may be studied in every valley where the stream is left to take its natural course; but in England, and in many other countries where land is valuable and cultivation carried on extensively, the rivers are never left to themselves, and, therefore, the changes that explain and illustrate these conditions are not perceived. In a natural state a river rarely follows the same course through its valley many seasons in succession. Either it chokes up its old bed and steps aside to form a new one, or, owing to a torrent, it cuts itself a new course altogether, and leaves the old bed dry. All our river beds have been formed in this way. It is not that the quantity of water brought down varies very much, but that the circumstances change, and new channels are cut, the deposits of course shifting. The whole width of the valley through which a river runs is of the same nature, and the deposits are due to the same cause. Hence the variety in the foundations in different parts of a valley far removed from the present course of the stream, which has not, perhaps, been allowed to shift for many centuries.

But in addition to ordinary alluvial bottoms resting on clay, limestone, or sandstone, as the case may be, and consisting of the usual admixture of sands, clays, and river gravels, are the instances in which the river valley has been ploughed out by the action of the ice, and has received large deposits of boulders, boulder clay, and the usual accompaniments of fine and coarse sand and gravel. Gravels are frequently found at levels very much above the bottom of the valley, and they not unfrequently even cap the hills through which the river is cut. The same kinds of gravel often occupy the valleys themselves.

Excellent as gravel is as a foundation when in sufficient quantity and uniform in texture, it can hardly be trusted unless its history be known. The gravels called diluvial are often comparatively free from loose sands and clays, and are then excellent for every purpose required by the architect or engineer. They are sound, well drained, healthy, and generally yield water at a small depth. But it is not so with the gravels occasionally found with boulder clay, nor with ordinary river gravels, and thus, as I have already pointed out, the history of gravel is an important inquiry when it is proposed to construct buildings upon it.

Natural drainage is very important in all large buildings. Without this, even if the foundations are sound, moisture will rise up by capillary action through almost every variety of stone and brick, and will in time deface the building and increase the action of weather on the surface. Certain rocks drain naturally, and are safe. Others may be drained with little difficulty, and may be made safe. Others, again, will tax the ingenuity and experience of the most accomplished architect, and will, after all, be only partially cured. There cannot be a doubt that in this latter, and also in the second case, the constructor would be greatly assisted by knowing the nature of the enemy he has to deal with, and this can only be done by a knowledge of rocks generally and of the local geology.

Very important questions arise in reference to the relative influence of certain rocks, on the sanitary condition of the buildings erected upon them. Thus, in a general sense, it may be considered as proved by experience that clay soils and other impermeable material near the surface are less healthy than well-drained sites, and more liable to attacks of fever, and that permeable soils and gravel are dry and healthy. There are, however, important modifications of this view dependent on the subsoil and underlying rock which are often out of sight and below even deep foundations, and here a knowledge of geology becomes necessary to the architect. It is well shown by Professor Pettenkofer, of Munich, that in certain cases where bands of clay intervene in gravel, the presence or absence of fever in the population corresponds exactly with the existence or otherwise of these impermeable deposits. In other words, even where the general subsoil enjoys a certain amount of natural drainage, the healthiness of the site depends strictly on the condition of the rocks at a considerable depth, and that stagnant subsoil water, even when its presence cannot be detected by ordinary observation, makes itself felt in a very serious manner.

In speaking of the applications of geology, I have avoided the mention of particular rocks as much as possible, because it is not so much the rock as its condition that affects the practical man. I have known granites porous and absorbent, limestones compact and non-absorbent, sandstones offering every possible variety in every respect, and even clays very different in different places. What is wanted is such a general acquaintance with the principles of stratification and the nature of rocks as shall enable the architect or builder to make the best use of the conditions he has to deal with. I cannot lay down rules that can be made use of without further trouble; I can only point out the key which will unlock the difficulty in each individual case, if it is applied properly and intelligently.

Water-supply from springs either at or moderately near the surface is a very essential matter in the case of buildings intended as habitations removed to some distance from pure running water. But it is now well known that however pleasant clear spring water may be to the taste, it is capable of containing, and does in certain cases contain, injurious ingredients sufficient to render it a fatal poison. There can be no doubt that certain superficial deposits and certain rocks are liable to induce this state in the water, while others are not. It is evident that the causes of events of this kind should be known to the architect, and it is highly desirable that he should be acquainted with the theory of springs, at least of such as are likely to affect buildings. Absorbent gravels resting on non-absorbent rocks may be expected to introduce poison into water when the ground is liable to be covered with decomposing animal or vegetable matter, or with sewage, for the rain entering them cannot fail to carry in water loaded with as much of such impurities as it can contain. Such of them as are soluble in water will certainly therefore mix with it, and render unwholesome all the water pumped from the bottom of such a deposit.

On the other hand, where water has a free exit from rocks, it is almost impossible that such injury can take place to any great extent. Land springs and Artesian springs from basins are dangerous. Springs from hill sides, or Artesian springs reaching water tapped in its progress to an outlet, are generally safe. How is it to be known what is the nature of the springs without some reference to the science of geology, and some knowledge of the laws of superposition of rocks?

The whole subject of the weathering of rocks deserves the careful study of all who have to deal with stone and brick. All material, without exception, is affected by exposure; but while some will remain almost unchanged, and even hardens when left to the action of the air, other kinds will at once decompose and rot. It is not always the hardest that is the best. This is especially the case with flags or stones splitting with parallel faces. Many very good flagstones are formed by the exposure of quarried and squared blocks during one winter, and then in the following spring splitting the mass by wedges in the cracks indicated. If left longer, they can no longer be split with advantage; and after a time it becomes impossible to split them at all. Something of this kind happens with all stones. After being quarried, stones are for some time in the state called green, and after exposure to a certain extent they are said to be seasoned. In the latter state they are regarded as fit for use; but after all it is doubtful, without experience, whether they will be permanently sound. It is evident that if the architect and builder knew more of the history of stones he would be able to use them to better advantage.

The study of stones in the quarry, and a careful examination of the effects of weathering and disintegration by the action of rain and frost of the same stone in the immediate neighbourhood, whether naturally exposed or placed in buildings of any kind, combined with a knowledge of the chemical composition, the peculiarities of aggregation, and the natural history of the stone itself and the beds with which it is associated, will very often suggest to the intelligent observer its probable weak points for the special service for which it is designed. There are accumulated stores of information of this kind that should be familiar to all who have to decide on the selection of stone, and it should be remembered that stone is in the nature of things an altered form of a very miscellaneous deposit, and that without especial care in selection and placing it is next to impossible to secure a large quantity of perfectly even quality.

You will observe that I have included a great variety of details as included within the very important subject of building sites, but I trust you will not think that I have done so without sufficient reason. I am well aware that in modern constructions beds of concrete play an important part in forming artificial foundations, and are much trusted to in keeping out damp and preventing unhealthy miasma. I wish to point out that however useful such an avoidance of the difficulty may be, it should not be trusted to implicitly, and I think it would be easy to show that there are cases where the danger and mischief would only be postponed for a time by such contrivance, and would reappear and act with full force when by irregular pressure on a bad and shifting subsoil the concrete becomes cracked and crushed long before the time has come when the building would begin to fail by reason of age and general wear.

I assume as entirely beyond discussion that in the exercise of his profession the architect desires only to do justice on the one hand to his own inventive genius, skill, and reputation, on the other to the highest interests of his client. I have endeavoured to show that in order to do this he must inform himself concerning and be to some extent familiar with the principles and

applications of the science of geology as now understood. He must from time to time call in the aid of this science to decide matters of vital importance, and he cannot do so properly without making them a subject of serious and special study. I have not entered into details, as they could hardly be fitly discussed in this place, but I have endeavoured to illustrate and explain the principles to which I think your attention as architects should be directed.

Since this memoir was in type, my attention has been directed by my friend, Dr. Letheby, to a pamphlet by Dr. Pettenkofer, in which attention is drawn to the great influence of subsoil and rock on certain diseases, especially cholera and typhus. Dr. Pettenkofer points out that in the case of Gibraltar and Malta it was proved by British statistical returns that at a time when cholera was raging over a large area, there were certain small localities that escaped. On investigation it was found that, whereas the subsoil to a great depth, and, in the case of Malta, the rock, was eminently porous and permeable, the spots that escaped were situated on impermeable clays.

There can, indeed, be no doubt that the health of a town is greatly influenced by the condition of the rock and soil on which it is built, and that generally a moderately porous soil, admitting of the removal of moisture by drainage, is conducive to health, especially in a damp and comparatively cold climate, like that of England; and also that with us gravel and limestone as subsoil and rock are healthy as well as pleasant. But it is equally certain that where the underlying rock is deep and permeable, admitting of a considerable alteration of level of that surface of permanent wetness which is sure to exist at some depth or other under such circumstances, but which varies with the season, the result may be different, and it may require both knowledge and judgment to decide as to the relative value of sites, even with regard to water only. It is also true that wherever there is a great collection of human beings living over a permeable soil and rock, the effect of the accumulation of refuse and sewage cannot but be felt in the course of time. The water percolating from the surface will carry down organic matter, and this in time will make itself felt by generating unhealthy vapours occasionally reaching the surface.

But there is another question to be considered, which in warm and dry climates rises into great importance, and with regard to which the observations of Dr. Pettenkofer are very suggestive. All rocks are capable of absorbing, and therefore usually contain a certain quantity of atmospheric air, either in its normal state or replaced by other gases. No doubt a certain change in the constitution of the gases absorbed may take place, in consequence of an action well known to take place in porous and spongy solids when mixed gases pass through them. The quantity of air or gases contained in all rocks must vary, and must be affected by changes of weather. During dry and hot weather large quantities are given off, and during colder weather re-absorbed. In rocks then that contain much air, either in consequence of their great absorbent power or their mass when there has been received into the body of the rock by percolation from above any quantity of organic matter, and this organic matter has become putrid, the gases given off during hot summer days are liable to become dangerous miasma, and when cholera and fever are prevalent are especially liable to communicate infection. I cannot but attribute to this cause the extremely bad sanitary state of some districts in the Mediterranean—healthy enough so long as there is rain, but poisonous in the dry autumn; and in these cases I can easily understand that the intervention of even a small and thin band of clay may be a source of safety, and the more so the nearer it is to the surface.

I need offer no apology for pointing out these facts and inferences in a memoir on the subject of building sites, and of which the application of geology to architecture is the professed subject. Sanitary considerations connected with, and arising out of, topographical and geological positions, can never be dissociated from the practice of architecture, and I am sure you will agree with me that all knowledge that can help to a conclusion in such matters is not only desirable, but ought to be considered indispensable to the architect.

The Late Mr. Lewis Vulliamy, Architect.—The death of this gentleman, at Clapham-common, on the 4th inst., has been announced.

THE LATE MR. HARDWICK, R.A., ARCHITECT.

PHILIP HARDWICK was born on the 15th of June, 1792, and at an early age began to study architecture under his father, Thomas Hardwick, who had been a pupil of Sir William Chambers.

After assisting his father for some years, Mr. Hardwick went abroad and studied for a short time in Italy. He was at Paris in 1815, when the allied armies occupied the city, and he often spoke of his visit to the Louvre, which contained the spoils of Europe, then about to be restored to the countries from which the first Napoleon had taken them. Mr. Hardwick returned to England in the autumn of 1818, and then began to practise his profession independently of his father, and soon after married the daughter of Mr. John Shaw, an architect of some reputation, best known by his hall at Christ's Hospital. The first work of importance sufficient to give Mr. Hardwick an opportunity of distinguishing himself was the Dock House and the warehouses for the St. Katherine's Dock Company, then a new undertaking,—a work requiring considerable skill in construction, from the difficult nature of the site. These docks were opened in 1825. Soon afterwards he was appointed architect to the Goldsmiths' Company, and erected their new hall, which was opened in the year 1836. We believe that few modern English architects have left a better monument of their skill than this building. The distribution of the rooms is at once magnificent and picturesque, and there are a breadth and simplicity in the exterior, which to those who knew him, are as striking characteristics of the man as they are architectural qualities appropriate to the use and position of the building. His next work of public importance was the entrance portico of the Euston Station of the London and North-Western Railway, then called the London and Birmingham Railway. This was the first station of any architectural pretensions erected in London; it was finished in the year 1838, and was the last building he designed without the assistance of his son. He was elected a member of the Royal Academy in 1839, and was appointed to succeed Sir Robert Smirke as treasurer in the year 1850, an office to which he devoted himself with untiring attention, taking great interest in all that concerned the Institution, and we believe the members of the Academy have always acknowledged their obligations to the energy and patience with which he managed the duties belonging to his office.

The erection of a new hall and library for the Society of Lincoln's-inn was placed in his hands in the year 1842, but he became seriously ill in that year, and was obliged to leave the work in the hands of his son, Mr. P. C. Hardwick. Up to this time he had been engaged in the execution of many buildings both in London and the country, and had that large and general practice for which his clearness of intellect and judgment eminently fitted him. About this period of his career, though only in his fifty-third year, his health failed so completely that he was compelled to confine himself to such practice as could be followed in his own room; but he was still enabled, though with much pain, and in constant bodily suffering, to attend committees; and at none was he so regular as at the meetings of the Royal Academy, to whose affairs, as we have said, he gave all the powers of an active mind, still unimpaired by disease. He was, however, compelled, by increasing infirmities, to resign the treasurership in the year 1861, and to withdraw from all participation in the practice of his profession, as well as from the society of his friends, which was a great privation to one of his hospitable nature. He was a Fellow of the Royal Society, and served for some time on the council. He took also much interest in the labours of the Geological, Antiquarian, and other societies, though his state of almost uninterrupted physical suffering prevented him using his leisure to contribute to their proceedings. He was one of the earliest members of the Institution of Civil Engineers, and one of the founders of the Royal Institute of British Architects. He received the Queen's gold medal in 1854. Mr. Hardwick was architect to the Duke of Wellington, Greenwich Hospital Commissioners, St. Bartholomew's Hospital, and other bodies. Besides the works already mentioned may be named the large hall at Euston Station, the hotels adjoining, and the Globe Insurance Office.

After upwards of twenty years of bodily suffering from a complaint in the spine, and weakness resulting from an extensive disease of the heart, he went to reside at Wimbledon, where he lived for the last five years, sinking gradually into a condition more and more feeble, and bearing his sufferings with ever-increasing patience and resignation. At last he became helpless in body and infirm in mind; and having been long conscious of his approaching death, he passed away in perfect calm, on the morning of the 28th of December. His funeral, which was quite private, at his own urgent request, took place on the 3rd of January, at Kensal-green.

Mr. Hardwick was much beloved and respected, not only by the members of his own profession, but by all who came in contact with him; and the wide influence he exerted may, we believe, be attributed as much to his good heart and unswerving probity as to his architectural skill and professional success.

WORKING MEN'S COLLEGE, LONDON.

THE Christmas *conversazione* was held in the new rooms, Great Ormond-street, on the 3rd inst. Mr. Thomas Hughes, M.P., received the visitors, and a selection of music was agreeably performed by the College choir. A number of works of art, the production of the students under Mr. Cave Thomas and Mr. Brewer, were exhibited.

We have already spoken of the new rooms. They are built on the lower portion of the ground in the rear of the college, each room measuring in the clear 30 ft. by 23 ft., including a corridor so arranged as to be a portion of the room. The height is 12 ft., and they are lighted by a 12 ft. span skylight. The estimated cost of the whole when finished is about 2,400*l*., of which 1,800*l*. have already been received. A further sum of 500*l*. is required to finish the museum. The College is, we believe, self-supporting; but to meet this extra expenditure the committee seek the aid of those who think, as we do, that the institution is doing good work.

THE WORKS AT ROTHERHAM WORKHOUSE.

SOME additions have been made to the workhouse, under the direction of Mr. Blackmoor, architect, by Mr. Harper. At the end of last year one of the builders, Mr. C. Morriss, who had tendered, wrote a letter to the Board of Guardians, asserting that the specification had not been carried out in all respects, and that this might explain his own want of success in tendering. At the last meeting of the guardians, another letter was received from Mr. Morriss, stating that proceedings at law had been commenced against him by Messrs. Blackmoor and Harper, in consequence of these statements, and asking leave to inspect, at the workhouse, in company with an architect, the plans, sections, and specifications submitted to him on his tendering for the building. The Board agreed to the request.

The imputation is a serious one, and the architect will do right in refuting it.

ROYAL ALBERT HALL.

ON Saturday in last week a large number of persons were present, by invitation, to hear some music by the band of the 1st Life Guards and a little singing, in the Albert Hall. Very satisfactory opinions were expressed, but as the mass of scaffolding in the centre and the boarding under the glass ceiling still remain up, it is impossible yet to say with certainty what the effect of music will be when the hall is brought into its normal condition. Many of the visitors on this occasion saw the hall for the first time, and were much struck with its vast size and accommodations. Some points were canvassed as open to criticism, the proportions of the arcade around the upper part, the *square* skylights seen within the arched openings, the comparatively large size of the cross-shaped spaces left in the cove for mosaics, as well as others. We will leave all this, however, for the present, confining ourselves to one remark, in the hope it may not be too late to prevent a blot. The large central light, or rather ceiling, is being glazed, and we were distressed to notice, in a part exposed to view, that the cross-rails and borders between the main beams that radiate to the centre are straight instead of circular: they should, as a matter of course, follow the line of the circular opening. If completed as begun, we fear this will prove a perpetual eyesore and cause for regret. Is it too late to change the arrangement?

KENSINGTON-ROAD AND THE ALBERT HALL.

THIS road, extending from Regent's-circus to Kensington, bordered by the Green Park on the left, and by Hyde Park on the right, may be denominated London's Western Boulevard. The importance of buildings in its course, the new Royal Academy, and especially the stupendous Hall of Arts, bestow upon it an increased importance; and since the sinuosities in the Royal town of Kensington have been opened and improved, the remaining straits on the line become more obvious.

The thoroughfare is of sufficient width save at two points: the first constriction being between Albert Gate and Charles-street, where its traverse is but 46 ft. This strait extends for 150 ft., where a row of seven inferior shops ought to be withdrawn some distance from the pavement, in order to give it greater width.

The other restriction of the way is at the Knightsbridge Barracks, which obtrudes upon the main thoroughfare fully half its width, presenting a stable and barrack-wall with windows, where first-class mansions ought to stand. These barracks have been long condemned as unsuited to troops, and destructive of the choicest position in London for a residential quarter. No doubt but in time they will be removed; but now, and before the opening of the 1871 Exhibition, together with Albert Hall, some rectification of the road ought to be made, so as to give effect to this grand approach to the finest quarter of the metropolis.

From Kensington to the Queen's Gate the thoroughfare is of ample width; but here the park railing is projected 15 ft. from the gateway, and advances on the road, in a curvilinear direction, bowing outwards as far as Prince's-gate, the lodge whereof stands about 40 ft. within the *enceinte*.

Now along the whole course of this railing, and within 5 ft. of it, there is a range of nearly full-grown forest trees as far as Knightsbridge Barracks, and another range of trees within 20 ft., forming a glade, which would make a charming public walk if the Park fence were withdrawn only 20 ft. (inclosing the inner range of trees), and the present Park side footway (which is, on an average, 16 ft.) thrown into the driftway; then this route would be worthy of its position, and would release from a great defect the Hall of Arts which is to be inaugurated on the 29th of March.

At present the way is not only restricted, but this Colosseum is approached diagonally, the road on the east of its frontage recedes, with a footway only 6 ft. to 8 ft. wide, bordered by five mean houses, without areas, and with doors and windows like those of an ancient City lane—the gardener's lodge, and store-sheds of Eden Lodge completing the line to the Exhibition-road.

If, as suggested, the increase of 20 ft. from the Park were devoted to the formation of a sylvan footway under the fine shady trees—*not one branch whereof should be lopped*,—there could be no expropriation in the dedication to public use of that narrow strip; although the railing were so far withdrawn, the ornature would be still the same; and instead of diminution, it would rather lend apparent extension to the inclosure.

So far as Albert Hall is concerned, the concession of the user of this narrow strip (from Queen's-gate to the Knightsbridge Barracks) would complete the rectification of the roadway. As to any further extension, or the appropriation of the site of Knightsbridge Barracks, that might await the consideration of authorities, who would discover that the ground-rent of *one half the space* of its foundation would fully repay the outlay requisite for the creation of healthful, convenient, and suitable quarters for the household troops, now placed so inaptly for both public interest as well as their own comfort.

On and after the 1st of May every avenue leading to the Exhibition will be crowded, and the Park drive will prove a valuable easement to the main road, so far as the permission goes for private carriages, other vehicles being restricted. The new road across the Park from Victoria-gate, Bayswater, to Prince's-gate, Kensington-gore, will afford an immense relief to general traffic, and has indeed already been a most serviceable concession to the western suburbs north and south of Hyde Park. This short cut has, however, one very palpable default. After passing the Serpentine Bridge, on the north end, it *curvets round the Powder Magazine*, descending by a fall of 10 ft., and ascending again by a rise of 12 ft., thus increasing the distance by 150 yards; whereas the road might be continued in a *direct line* by the west side of the Magazine, where, by an easy gradient, it would cross the Ha-ha, and join the new road without any divergence and without disturbing any trees save two unsightly pollard chestnuts,—in fact, the range of vigorous chestnut plantation which stands 10 ft. from the garden broad walk, would seem to have been planted in line for the purpose of adorning such an avenue; and at the same time no change need be made in the Magazine fence-wall (extending only about 120 ft.) unless it should hereafter appear advisable to remove so dangerous a repository to a safe distance from an important and densely-populated suburb. In case of accident, its central position in the Park could give little immunity to the range of mansions around its borders (the Hall of Arts in especial), while its removal to Woolwich or Wormwood Scrubs would not much incommode the service of the commissariat; and the planting off and throwing open the space of its foundation and *chevaux de frise* would be a restitution of woodland and a boon to the community.

As the Commissioners are now having the boundary-railings fixed, and the fag-end of the Park unified with the Gardens, and tastefully and effectively adorned, the present is the occasion for a masterly completion of our incomparable Park and Gardens.

A PLEA FOR PLEASURE.

PARIS AND ATHENS.

THERE can be few more interesting or instructive subjects in the history of fine art and architecture than that of the origin and actuating motive which created the art of the great *cities* in past times. Sometimes it has been said to have been wars, and sometimes it has all been referred to the imaginative faculty. Let us adduce Athens, and ask what it was that made the city of Athens the head-quarters of art, and enabled it to produce, and no one doubts that it did produce, the finest art that the world has ever yet seen, both in sculpture and architecture, and perhaps in painting. The Athenians, we are assured, were a fickle and pleasure-loving people, fond of shows and games and theatrical representations, and were averse to the serious business of life, as that term is now understood. Indeed, the good people of Athens seem to have led a thoughtless and joyous existence, and to have had the faculty of making the very most out of everything; but of all things, they would seem to have revelled in *games* and *shows*, and out of these pastimes to have really created the serious business of life; for out of these shows and theatrical representations they brought into existence their great and superlative art. Most of the great sculpture of Greece was, there can be but little doubt, inspired by these representations, adding a certain amount of religious feeling; so that old Athens may be said to have created that which the world so envies and tries to imitate out of its mere pleasures and amusements. It was the modern world reversed. It would be difficult to single out a subject more instructive, at the present moment, than this; for the unfortunate city of Paris, now so closely hemmed in, is not a little like old Athens: its chief characteristic is, or was, "pleasure-loving" and "amusement."

Putting aside the fatal love of military glory, which has made France a menace and a nuisance to the rest of the world, what, as in Athens, is the chief aim of Paris? or what is there, or was there, or will there yet be, in it which so rouses the interest and even wrath of the good world elsewhere? What is there to be seen in Paris and not elsewhere? And what is the great principle at work always which has made it a byeword for pleasure, as it is called? And how have the people of Paris managed to bring it about? In short, how is it that what is here in London, and there at Berlin, an *accident*, is in Paris a *principle* and a system? Pleasure systematised! Is it, indeed, an evil or a good this effort to systematise pleasure after the example of artistic Athens? One of the great problems of the future, says the *Times*, is to rebuild and to render beautiful this great City of London, and the sooner it is begun the better; and one of the main objects of the to be universal system of education is to lead the mass of the people, so we are told, to "healthier pleasures," as well as to make them "better fitted for business" and the serious duties of life; so that if it could be shown that poor beleaguered Paris has already more than commenced the rebuilding of its so-called hideous old streets, and begun even to make of "pleasure" a science, and publicly to recognise it as a something, may we not fairly say that it has taught the world something, and is to be excused for some of its less creditable doings?

But is there not a deeper meaning still to be found in this great and central idea of "amusement?" If we had to define art by the shortest possible word, we might say, *Art is pleasure*, and the avoidance of pain, or nothingness. There is no attempt ever made either in Paris, or London, or anywhere else, to create pleasure or amusement *without* art, fine art, entering into it in some form or other, either good or bad. It may be good art, or very bad art, but still art in some form or other is the ultimate end of it. No one ever starts a place of amusement or pleasure without the attempt, at least, of rendering it as artistic as possible, from the travelling wax-work show to the Italian Opera. Art is the constant and steady aim of those who offer them to the pleasure-loving public. We once heard a very learned and distinguished man in Westminster Abbey declare that the chief sin he saw in modern and renovated Paris was "its new grand opera-house," and which he declared was the largest and costliest building he had ever seen; and he went on to condemn it, not on account of its art and size and cost, but because it was to be devoted to pleasure, to music, dancing, plays, and pastimes, all of them demanding almost unlimited artistic resources,—nay, genius itself, and that of the highest order. What a singular thing it is that artistic talent should have the misfortune to bring on itself such heavy charges, and that one of the greatest of gifts, and one which no mere *education* can bestow, should be the means of bringing condemnation on the place it was meant to ornament and make pleasant to eyesight and to human sense. But so it is. How much we have to learn of art and its uses, and resources, and ultimate ends. Paris is mentally devoted by not a few to destruction simply from the fact of its giving birth to those who make it their serious business to invent and manage such things as these, mere pleasures, or ways of passing time pleasantly and not painfully, or as though nothing existed.

Again, may we not ask in justice to artistic Paris, for which it is impossible not to feel sympathy, what it is that constitutes the main difference between the business and pleasure of it, and of the business and pleasure of more sedate and artistically quiet places? What is the main difference between Paris and London? Why, perhaps, mainly this, that here business is business, and nothing else, while in Paris business itself would seem to be a pleasure, and, we had almost said it,—a fine art. Keeping shop in Paris is a positive pleasure and delight, and the "serious duties" of life are made artistic, and not a little interesting and pleasurable. But not only has France sought to make the common business of life artistic,—it has more than all tried to systematise its amusements, or, in other words, like Athens, to render its amusements artistic and expressive of the wants and feelings of the time. Whether or how it has succeeded, or whether it has not neglected more important matters, are other questions. In Greece the shows and pleasures created the fine art; without the trifling shows, and theatres, and circus games, and "olympiads," the *art* of Greece, the envy and despair of us moderns, could have had no existence. Old Athens, like new Paris, was a city of amusements, and the great and unrivalled fine art of it, and in it, and which made it what it was, was mainly the growth out of its pleasures and pastimes, and, if the reader will, its showy and earth-born religion. What are our poor and miserable attempts at art to the art of Greece? Simply nothing! Not worth a word; for our art, at its very best, is nothing more than a series of attempts at the *copying* the art of those who have preceded us. We try to copy, and to see through the copy the pleasures and shows of Athens, or other antique cities, given over in their day to pleasures and trifles. At any West-end club you will see into the ways of some city of the past in this way. We would therefore ask those who condemn so entirely the pleasures and amusements of Paris, to consider

whether or not she is wholly wrong in the attempt to follow out the famous examples of the great art-producing cities of the old world. Its future may be nothing short of this, — the beginning and creation of the art of the future, by the preliminary step of the systematising of its present pleasures and shows, growing as they do, there as everywhere, out of its business. There has been as yet no time for the idea to work, and the misery of this bad war will be for the present generation, that it has hindered its progress. Assuredly the very best wish of all must be that in the future France will put from her "military glory," and create for herself at least a fine art of the future through the acting and living art always to be found in her actual and every-day life, and to do that by infusing into that *life* a high artistic element.

THE BISHOP'S PALACE, WELLS.

THE Bishop's Palace at Wells has lately undergone several works of restoration. The interesting thirteenth-century undercroft, which in former times had been coated all over with whitewash and used as a cellar and lumber-room, has been thoroughly cleansed from its grime, and substantially repaired. The undercroft is in two aisles, each containing five bays, and is groined with bold chamfered ribs in quadripartite compartments, the filling-in being probably of rough ragstone, which is plastered over. This, no doubt, is the original plastering, and it has only been found needful to stop and repair it in the defective parts with cement. This ceiling was evidently originally painted with the "masonry" pattern, and studded with little rosettes. Curiously enough, the only trace of this decoration has actually been *preserved* by an act of former vandalism, *i.e.*, a brick wall put up transversely across the undercroft. Its builders seem to have carefully removed the ornamentation everywhere else, but possibly did not think it worth while to destroy the pattern here, as the wall would conceal it. This encroachment has, of course, been pulled down during the recent works, and hence the interesting discovery above mentioned. It is proposed at some future time to carry out the original design of ornamenting the vaulting with the addition of other new simple mural decoration. As this undercroft is to be used as the regular dining-hall for the Bishop and his family something of this kind seems desirable to relieve the *cold* appearance of the plain rough stucco and ashlar. The latter, which had previously been quite invisible, is now exposed to view, and the walls are re-plastered with rough stucco. It has been found necessary in many parts to replace the defective masonry, which had been much knocked about. This was more particularly the case with the blue lias caps and bases in the central arcade of the undercroft, which have been pieced and slightly polished. On the east side of this apartment are five narrow lancet windows; these have been filled with ornamental lead quarry glazing, and the heads of the lights decorated with coloured coats of arms, &c. A new two-light window has been inserted into the open archway (on the south side), which led into a conservatory put up some thirty years since. This has been filled with painted glass, in which, however, there is a considerable admixture of white glass; so as not to diminish sensibly the amount of light. All the glazing has been executed by Mr. Charles Hudson, of London.

The rough irregular concrete floor has been covered with a thin coat of Portland cement. As only portions of the undercroft will be carpeted, it is proposed at a future time to insert ornamental bands of tiles, or some other material, dividing the different bays. On the west side a large and deep hooded chimney-piece has been added, constructed of Doulting and blue lias stone. There are also two new wainscot doors, with ornamental moulded panels. Beyond the north end of the undercroft are two vaulted chambers, one of which was used for a beer-cellar, the other for wine. The former has been repaired, cleaned, and converted into a vestibule, or serving-room; and the wall, which formerly cut up into its vaulting, has been removed. Messrs. Haden & Son, of Trowbridge have been employed for a combined hot-air and hot-water apparatus. In conclusion, it may be stated that notwithstanding the small size of the windows, the undercroft is by no means gloomy, but, on the contrary, is a cheerful apartment, which may be accounted for by the general light tint of the room, and the broad splays to the windows. All these works have been carried out under the superintendence of Mr. Ferrey, F.S.A., by Mr. G. P. White, of Vauxhall-bridge-road (the contractor for the restorations of the west front of the cathedral). It is due to the present bishop, Lord Arthur Hervey, to state that the idea of converting this undercroft into a dining-hall was that of his lordship; and thus one of the most interesting features of the palace has been preserved from further injury, and brought into prominent use.

ARCHITECTURE A LIVING ART.*

THERE is an opinion pretty widespread, though I trust not universal, that the career of architecture as an original and real art is over; that architecture is a thing of the past, without existence in the present or hope of a future one; and that all we can now do is to reproduce faithfully the works of the past—that is to say, become copyists and plagiarists, which some schools of architects are content to do, and reduce themselves to archæologists. This I consider an entirely erroneous view of the subject. If anything has become defunct it is the architectural genius, or rather the common sense of the present race of architects, and not architecture, which can never be defunct, no more than poetry or any other form of art, while nature and the heart of man endures; and nothing can necessitate plagiarism or copying but ignorance or stupidity. Therefore, if you see an architect, when employed to design a church, copying one already existing instead, some old one generally, do not conclude that the art is effete, worn out, or obsolete, but that the architect's want of knowledge, imagination, or invention alone is to blame.

My belief is that the art would go on for ever as it has gone, if we treated it as in other times it was treated; in other words, that the same architectural languages or styles would lend themselves to all new purposes, to the production of truly original works: and that, in order to be original, we do not need to begin again from nothing, as some writers suggest,—a proceeding for which there is no precedent in the entire history of architecture.

It is true the career of our art has not been one of uniform progress, and that she reached in early Greece an exquisite beauty and perfection of form which she has reached nowhere else, and that in these attributes we can never go beyond the Greeks; for this especial reasons can be assigned in the nature of their social and political institutions. In Greece the general art culture of the people rendered every man a patron or judge of their architecture, which, under such fostering care, reached what must be deemed perfection in that particular direction it took.

But it is evident that this was but one phase of the art, for she has shone out in different periods of history and different parts of the world with brilliancy and beauty in totally different forms; in Rome; among the Saracens and Moors in Spain, Egypt, Persia, Syria; in the Middle Ages in Europe; and in Italy at the Revival, in innumerable works with that genuine stamp upon them which is a joy for ever. Nay, it had shone out before in Egypt and Assyria, and India, and exhibited in the porticoes and halls of columns of the temples, and palace temples, and the winged bulls and sphinxes and elephants, some of the noblest qualities which architecture has ever exhibited, yet totally different in kind and character from the Greek.

Cast your eye over the chart of architectural history, and how varied are the streams it encounters! What a variety of aspects and characters the art has already assumed in different countries, and at different times in the same country. The German Romanesque, for example, now distinct from the Norman and Lombard; the Italian, Gothic, and the Spanish, from each other, and both from the Gothics of Germany, France, and England. How different all from the Byzantine styles of Constantinople and Asia. How varied the styles of the Saracens, though inspired by the self-same religion, in different countries—Spain, Persia, Egypt, Syria, India. The architecture of the south of France, how diverse from that of the north. What a host of beautiful sub-styles in Spain, Sicily, and south of Italy!—all different and all beautiful. While the varieties of the renaissance and revived classic in Italy—the Roman, Florentine, Venetian—all different from each other and from the renaissance of France, Germany, and England, and, like the rest, bearing the impress of the ruling thought of their creators—cannot fail to charm the most unobservant.

Of this great and varied system of architecture the Greeks, it is evident, only produced the first formed beautiful alphabet or language,—a limited one,—which was speedily augmented by the Romans, by their application of the arch and dome, introduction of super-columnation, and development of the Corinthian column, to which they gave immense variety of character, and formed the whole into a vast storehouse, vast and varied as the Roman empire itself, and which has furnished the leading elements of all the styles of the world. From it the Romanesque of Italy, France, and Spain, the Lombard, Frankish, Burgundian, Norman, the styles of the south of France, and the various pointed Gothics of Europe, were derived, by a succession of changes and modifications, and admixture of Northern elements, just as the Romance languages, the Provençal or Langue d'Oc, the Langue d'Oil, with the present French, Spanish, and Italian languages, from the Latin, mixed in various degrees with the Teutonic dialects.

The Greek, it is true, possessed qualities, beautiful subtilty of curve, and refinements which did not enter into any subsequent style; but this was because it was not understood as it has since become understood by us. All the refinements of Greek architecture could have been embodied in the great Roman works, and in the domed compositions of Western Europe. Had they been, these buildings would, in being nobler compositions than the Greek temples, have been an immense advance upon those structures. How superior would have been St. Paul's Cathedral to the Parthenon,—superior in composition and variety,—if Wren had known Greek architecture, and given it all the refinements of that building! The advance may yet be made. It is a very possible one, and here, therefore, is a wide and glorious field open to the architect,—a way of advance and progress.

What does all this show more clearly than the truth that, like the Hebe mother, Nature, who is always equal to herself, and from whom all art flows, architecture is ever young, and possessed of an unlimited field for originality and variety? I believe she still has the power to gather into herself all that is beautiful and sublime in nature, and reproduce it, elevated and idealised, for our gratification. Beauty is her object,—to present it in new forms to us is her work, and of this task she is as capable at this hour as in the palmiest days of old.

I believe no phase of art can become effete; for the objects of art, beauty, truth, and virtue, are immortal, and spring for ever in nature and the human breast; they cannot fail, for they are luminous shadows cast to us from the Eternal and Unfailing, the Infinite and the Fair.

* From a paper by Mr. S. Huggins, read at a meeting of the Liverpool Architectural Society.

WHITE LEAD AND ZINC WHITE.

IN the course of the Cantor Lectures, at the Society of Arts, "On Artists' Colours and Pigments," the lecturer, Mr. Barff, made some observations on white-lead which may usefully find a place in our pages:—

White-lead has been made for years past according to what is called the Dutch method. Lead is cast into plates, and these plates, in some factories, are rolled into coils. These coils, then, are immersed in earthen pots; the pots are placed in a row, and a small quantity of vinegar is put into each pot. On the top of one row of pots a board is placed, and then other pots above, and so a stack is made. Between the interstices of the pots is put spent tan, or some other substance which by oxidation will evolve heat and also carbonic acid gas. Now, the heat which is evolved in oxidation of the spent tan is useful in volatilising the acid from the vinegar, and in the presence of this acetate the oxygen of the air oxidises the lead. The oxide of lead is dissolved by the acid, and the normal acetate of lead is formed. More oxide is produced, and this is dissolved by the normal acetate, and then you have basic acetate. When substances containing carbon are oxidised carbonic acid is the reproduct of the oxidation, when the oxygen is

in excess, as in this particular case. Carbonic acid is then formed by the oxidation of the spent tan. We formed it here by acting on the carbonate by an acid which was sufficiently strong to turn the carbonic acid out. The carbonic acid then unites with the oxide of lead which was dissolved in the normal acetate, and a thin film of lead carbonate is formed. These thin films go on forming in succession, until at last nearly the whole of the lead is converted into carbonate, which retains the shape of the original lead. In some cases gratings of lead are used. When the lead is in this state it is ground in water and reduced to a fine powder, and is then made up into the sort of pigments required, either with water or with oil. This is, or rather was, an operation attended with considerable danger to the workmen, who were subjected to what is termed lead-poisoning, to which, unfortunately, many painters, from want of cleanly habits, are subject now. There have been introduced, however, improvements in the grinding of white lead, which have to a considerable extent freed the workmen from the liability to this kind of poisoning.

I have now briefly described the method in which white-lead is prepared. Other pigments containing lead have been used in lieu of white lead, but none of them are found to possess the same body. There is a process known as Patteson's process, of making oxy-chloryde of lead; but it is not necessary to take up time in describing the process, because I dare say no person uses any pigment made of this substance, for it has not the body which white-lead has. Probably the fact that white-lead possesses the body it has is the reason why it has been so largely used, and why so many of our paintings which have been painted with it have come to a most untimely end. I know of no pigment so liable to change of colour as white-lead. In saying this, I know that there are many who will not agree with me. They know that white-lead works well and easily, and they like it because it covers down well; but when I have pointed out to you some of the great defects under which it labours, I hope I shall convert at least some of you to my opinion. If you take some oil, and if to that you add lime-water, you know that the oil will mix with the lime-water, and form a kind of emulsion. Again, if you boil oil or fat with soda, you know that a kind of soap is formed, and the process of manufacturing soap is termed the process of saponification. Now if, instead of boiling fat with soda or alkali we boil it with plumbic oxide or oxide of lead, we shall form a soap, and that soap goes by the name amongst medical men, of *emplastium plumbi*, or lead plaster. Here is a roll of it. This is a substance made by the saponification of oil with the oxide of lead. Because this oxide and carbonate of lead have the power of saponifying oils, you get in white lead that peculiarly smooth, easy working which you do not get with any other white pigment; and it is on this account, for one reason, that it is liked by artists and painters. Here I have a piece of paper, coated with some of this lead-plaster; and if we throw a light upon it, you will see that the substance is semi-transparent. Mr. Newton was kind enough to give me a few valuable hints for my lecture; and amongst other things, he spoke to me of this peculiarity of lead, that it will saponify and form this sort of transparent substance. He told me an anecdote of the famous landscape-painter, Mr. Wilson, who made an addition to a room in his house. The old part of the room had been painted a dark colour; the new part, of course, when it left the workmen's hands, was perfectly white, and therefore the painters painted down the dark colour with white-lead, until the whole room displayed one uniform tint. After a while, however, it was found that the part which was originally painted dark became dark again; the dark paint, in fact, showed through the white-lead. Sometimes, possibly, when an artist wishes to put in figures upon a dark background that he has painted, he uses white-lead, and the figures will stand out well and brilliantly at first, but after a time the dark colour upon which they are painted strikes through the lead, and the figures of course recede. Now, this striking through is owing to a slight process of saponification, no doubt owing to an interchange between the carbonic acid of the lead-carbonate and the stearic and oleic acids of the oil with which the lead is mixed; so that, in time, the white-lead, which has a body which makes it so great a favourite with artists, loses that body, and becomes a transparent or semi-transparent substance, something like this lead plaster. Here is a reason why white-lead should not be used unless the ground has previously been brought to a light colour; and I have been informed by Mr. Newton, also, that it was the custom of Mr. Stanfield, the celebrated marine painter, whenever he had to paint a rope in over other painting, he always cut away his painting from behind it, being well aware that otherwise the colour of that painting would strike through the white-lead.

There is another objection to the use of white-lead, and really a very valid one it is. It often strikes me with wonder how persons can go on year after year laying out sums of money for having their houses painted with white-lead when other pigments which will keep their colour might well be employed. A house painted with white-lead after some time darkens in tint considerably; the colour is changed by some influence that is acting upon it through the air, and that influence is sulphuretted hydrogen gas. If you paint doors placed near a drain from which this gas escapes with white-lead, those doors will become browned and blackened, as we all know. . . .

Whilst this experiment is going on, I will show you how to test the purity of white-lead; for, if we do use this pigment, we should certainly like to employ it in as pure a state as possible. Now, white-lead is very often, particularly that which you procure at ordinary shops, adulterated with a substance called sulphate of baryta, or commonly, barytes. This is much more transparent when ground with oil than white-lead itself, and you will perceive that it will materially impair that property for which white-lead is valued, viz., that of covering down well and solidly. White-lead adulterated with baryta has, generally speaking, a bluish sort of look; it is semi-transparent. It has not that opacity that pure white-lead has. I will take a small piece of this white-lead and put it into a test-tube, and add to it a little of the substance commonly known by the name of nitric acid, or aquafortis, and some water. If the lead is pure, the whole of it will dissolve in this liquid, and we shall have a clear solution. If it does not dissolve, there is a white precipitate, which you will see after the lecture: it will fall down to the bottom of the tube, and that precipitate is sulphate of baryta. Sulphate of baryta is insoluble in aquafortis, but carbonate of lead, and most lead salts, are soluble in it. There is another very excellent test for the purity of white-lead, which is this. If you take a small portion, and grind it up with a little carbonate of soda into a small pellet about the size of a pea, and then put it upon a piece of charcoal, and hold it in the middle flame of a blow-pipe for some short time, the sulphate of baryta becomes decomposed, and you get sulphide of sodium formed. If this sulphide of sodium be acted upon by an acid liquid, sulphuretted hydrogen is given off, which could not be formed from carbonate of lead, for in it there is no sulphur at all; and inasmuch as sulphate of baryta is the impurity for which we have to look, the presence of sulphide after this treatment indicates that it was with the white-lead which was examined.

As I have given you reasons, extremely cogent why white-lead should not be used as a pigment, you will no doubt ask me, what is to take its place? I cannot tell you, not if the requirements of all artists are to be met. I cannot suggest a subject that will paint as easily as white-lead. I am, however, going to select one which has advantages so infinitely superior to white-lead, in giving permanency to your pictures, that I am sure the little mechanical difference that will arise in its employment will not be considered, when you know that it is a substance which is absolutely indestructible as to its tint, if submitted to those influences which destroy the purity of the colour of white-lead. The substance I allude to is zinc-white. Here is a solution of zinc sulphate. I will put a small quantity of it into this beaker-glass, and will then add to it a solution of caustic soda. You see we shall get a white precipitate. I add the caustic soda cautiously and slowly, because the white precipitate formed is soluble in an excess of caustic soda; as you see, by adding more of the soda, it is gradually disappearing. The substance precipitated is called zinc hydrate,—that is to say, zinc oxide united with the elements, which forms what is termed by chemists a molecule of water. The presence of the water in this compound destroys its body entirely, so that in this form it cannot be used as a pigment. If the substance precipitated—the zinc hydrate—be submitted to the action of heat, this water of hydration can be driven off, and we shall get a white powder. There is some in this bottle, which is zinc oxide, containing zinc and oxygen only, made in this way. The zinc white has more body, of course, than it has in the hydrated form, but it has not sufficient body for a pigment. This specimen of zinc white is made by Messrs. Winsor & Newton, on a large scale, by another process. Zinc is kept at a high temperature, and a current of air is gradually admitted to it. The zinc burns in the oxygen of air, and the product is zinc white, much more dense than that which can be procured by any method of precipitation.

Now, the question is, is zinc-white liable to the same destructive influence as white-lead? I will show you an experiment to prove that it is not. This is a solution of zinc sulphate, to which I added some caustic soda. I will now put water to it and pass in sulphuretted hydrogen gas, when you will see that the precipitate formed will be white, and not black. We will put some zinc-white into the bell jar, for the very obvious reason that sulphuretted hydrogen gas has a most unpleasant smell. Here is a specimen of zinc-white. If we were to submit this to the same test to which we submitted the white-lead just now, we should find no change take place whatever in its colour, for sulphurretted hydrogren has no effect upon zinc as to its colour, because zinc sulphide is white.

MRS. BOWES'S MANSION AND GALLERIES AT BARNARD CASTLE, DURHAM.

WE illustrate in our present Number a remarkable building. The foundation stone of it was laid on the 27th of November, 1869, by Joséphine Bénôite, Countess of Montalbo, wife of Mr. John Bowes, of Streatham Castle, since which time the work has been progressing rapidly.

It is designed as much for a museum and picture galleries as for a mansion, as it is the intention of Mrs. Bowes to place there a large and valuable collection of ancient and modern paintings, and objects of art and curiosity, which she has been collecting with care for many years.

The plan of the arrangement, with the exception of that portion for the sculptor, museum, and picture galleries, is not yet definitely fixed, further than the main walls, as it is not yet decided which portion may be set apart for the above-named objects of arts and curiosities.

The basement story is intended for the servants' apartments, kitchens, &c.; these are entered from each end of the building, behind which are the cellars, built entirely of dressed stone.

On the ground-floor, in the centre pavilion, is the entrance-hall, 48 ft. 6 in. by 40 ft., and 30 ft. in height, and adjoining is the principal staircase, 37 ft. by 32 ft. Within, these are being built of polished ashlar work, having pillars and pilasters, with marble panels, carved caps, mouldings, and spandrels. The stairs and galleries will be of polished stone, about 10 ft. in width. On each side of the entrance-hall are suites of large rooms; and behind are the museum, and painting and sculpture galleries, 200 ft. in length, by 45 ft. in width.

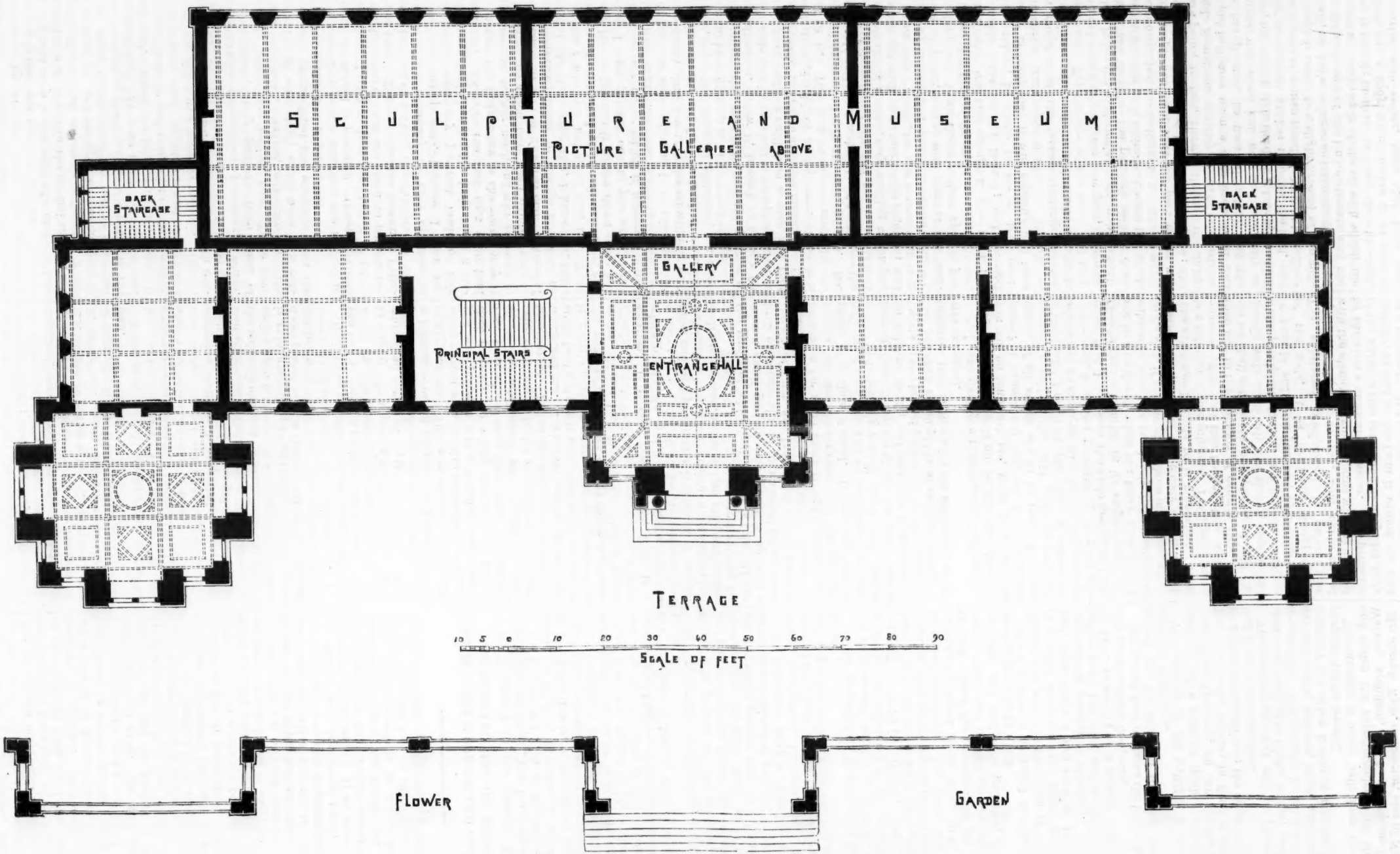
The first-floor is arranged the same as the ground-floor, with the exception of the addition of a grand reception-room above the entrance-hall, from which a fine view of the beautiful surrounding country is obtained. The picture gallery is on this floor, and is 200 ft. in length, by 45 ft. in width; it is lighted from the roof, and made entirely fire-proof.

The second floor contains the bed and dressing rooms, and the attics in the roof include the servants' bedrooms.

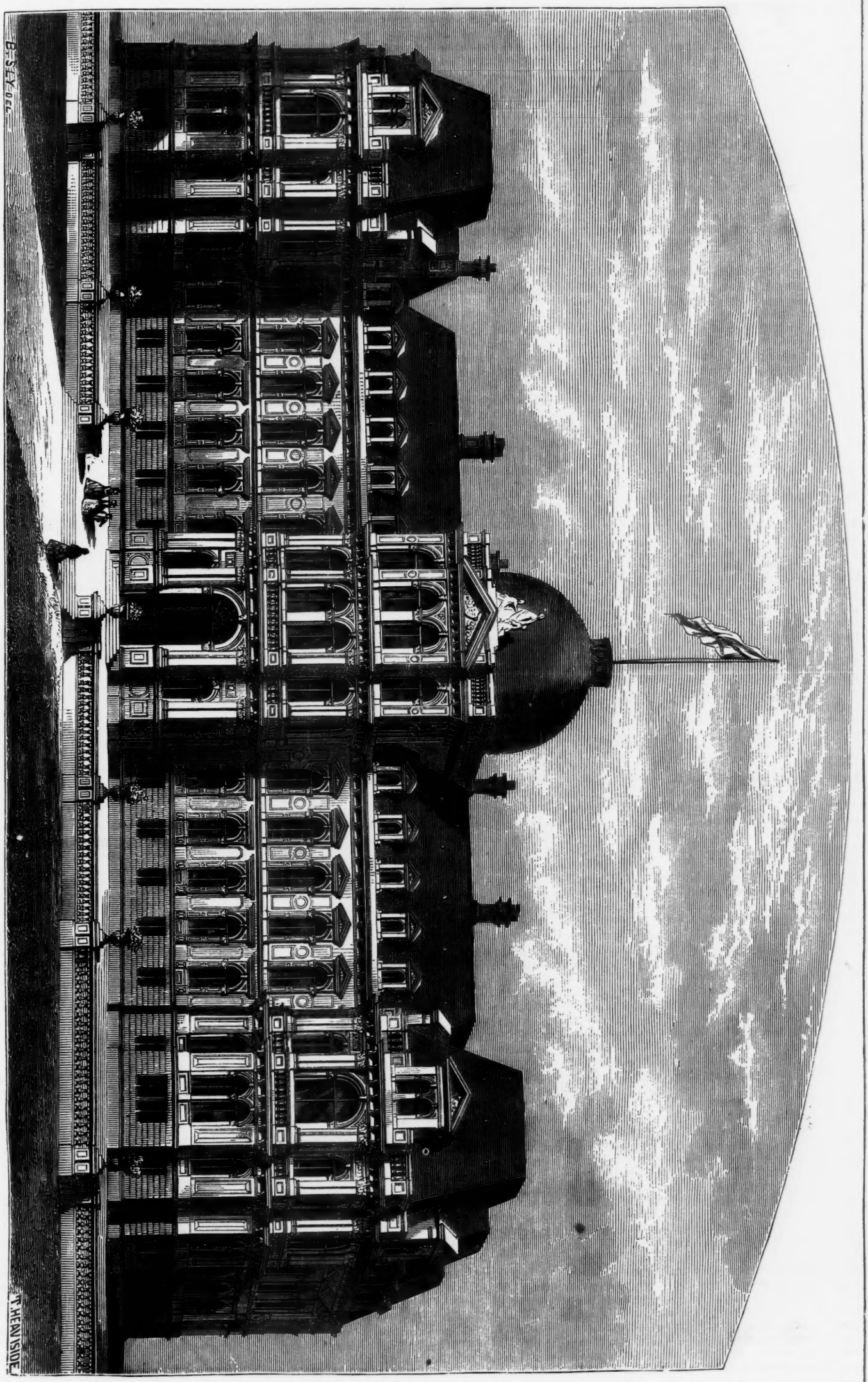
The exterior of the building is of polished masonry, of a superior quality of stone from Dun House Quarries, on Mr. Bowes's estate. The ornamental terrace in front is approached by a wide carriage-drive; the steps in the centre lead to the flower-gardens.

The entrance gateway will be placed on the main road leading to Greta Bridge, and will be ornamental. The grounds are intended to be laid out with walks, terraces, lakes, gardens, and an orangery and other buildings necessary for the purpose will be erected.

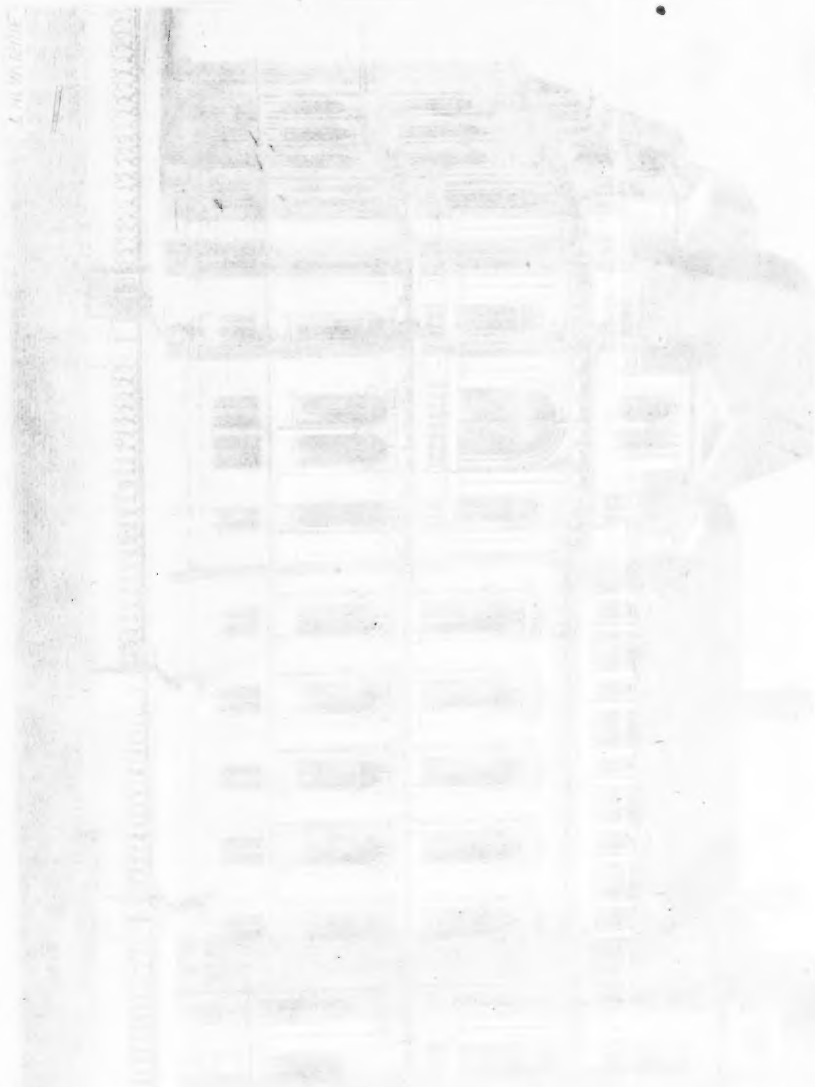
The mansion is being built from the designs and under the superintendence of Mr. J. E. Watson, architect, of Newcastle-on-Tyne, by Mr. Joseph Kyle, contractor, also of Newcastle, who is intrusted with the execution of the whole of the works.



NEW MANSION, MUSEUM, AND GALLERIES, BARNARD CASTLE.
Plan of Ground Floor.



MRS. BOWES'S MANSION AND MUSEUM, BARNARD CASTLE, DURHAM.—MR. J. E. WATSON, ARCHITECT.



SOME THINGS I DON'T WANT IN THE BUILDING TRADES.

I DON'T want my house put in repair, or rather out of repair, by a master who employs "Jacks of all Trades."

I don't want bricklayers' labourers, or hodmen, to turn builders; because they usually know about as much of an architect's plans and specifications as a cow does of an eclipse.

I don't want fresh-water sand to be supplied to me from the neighbourhood of Ramsgate or Margate or other equally pleasant sea-side place.

I don't want my foreman to tell me too much at one time about the faults of the workmen under him, as I may forget asking him about himself.

I don't want a builder or carpenter to give a coat of paint to any joinery work he may be doing for me until I have examined first the material and workmanship.

I don't want any jobbing carpenter or joiner whom I may employ to bring a lump of putty in his tool-basket. I prefer leaving the use of putty to the painters.

I don't want jobbing plumbers to spend three days upon the roof soldering up a crack in the gutter, and, when done, leaving fresher cracks behind them. The practice is something akin to "cut and come again."

I don't want scaffolding to be lashed together with rotten ropes, and the whole stage to have an unmistakable incline to the street instead of a "lean-to" inwards.

I don't want boys put to learn any of the building trades until they have received a tolerable elementary and technical education.

I don't want builders in general to be putting in estimates with hundreds and even thousands of pounds difference in the one job. The public can only think, like me, that they are dishonestly inclined or that they do not know their business. This charitable view of the matter covers a multitude of sins.

I don't want a contractor to undertake a job at a price that he knows will not pay, and then throw the fault of his bankruptcy on "that blackguard building."

I don't want 1½ in. sashes of white deal to be put into a building, instead of 2½ in. of red deal, as contracted for.

I don't want any more hodmen to be carrying up the weight of themselves in their hod as well as their bricks; I would much prefer seeing the poor human machines tempering the mortar or wheeling the barrow, while the donkey engine, the hydraulic lift, or the old grey horse, worked the pulley.

I don't want builders' carts to be screeching in the city like a locomotive whistle. A little grease might ease the wheel and the labour of the horse at the same time, and give me and others the opportunity of hearing what is spoken as well as seeing what is done.

I don't want house-doors to be made badly, hung badly, or composed of green and unseasoned timber.

I don't want locks, keys, door, window, and window-blind furniture and fastenings, that are manufactured in Birmingham to "sell," to be used in any of my houses. I was "sold" once. A burnt child dreads the fire.

I don't want any of my workmen to "kick" a gentleman or lady, or even the architect, should he happen to come into a new building to see how it progresses. "Kicks" of any kind, whether in the shin, or for beer, are simply unbearable. All spirited workmen ought to be above the mean practice of a kick, or they deserve one.

I don't want common plasterers to imagine that they are modellers or workers of Scagliola.

I don't want stone-masons or stone-cutters, or mural masons to ape the *role* of sculptors, or to think that the hideous effigies they cut on corbels and friezes have any relation to art.

I don't want houses built first and designed afterwards, or rather wedged into shape, and braced into form.

I don't want surveyors in general to dub themselves civil engineers, or civil engineers to think that they know as much about architecture as legitimate professionals whom they bark at but are unable to bite.

I don't want to be compelled to pay any workman a fair day's wages for a half-day's work.

I don't want an employer to act towards his workmen as if he thought their sinews and thews were of iron, instead of flesh and blood.

I don't want any kind of old rubbish of brick and stone to be bundled into walls and partitions, and then plastered over "hurry skurry." Trade infamy, like murder, "will out" sooner or later.

I don't want men to wear flesh and bone, and waste sweat and blood, in forms of labour to which machinery can be applied, and by which valuable human life and labour can be better and more profitably utilised.

I don't want to say much more at present about trade in general or trade in particular, for fear I may be accused of "spoiling trade," and "rattened" accordingly, both by master and man.

Lastly, I don't want to know whether I have offended any of the readers of the *Builder*. If the cap fits any of them, let them wear it, without my apology, as I object to the rude practice of first cutting a man's head, and then giving him a plaster. ONE WHO KNOWS.

VENTILATION OF HOSPITALS FOR THE SICK BY OPEN FIREPLACES.

SIR,—A correspondent of the *Edinburgh Daily Review* suggests that "a supply of fresh air should be led on to each patient's bed by means of a ½-in. pipe; and also that the foul air charged with the dreaded germs of disease should be extracted from the wards by pipes led into *one*, by which the impure air would be passed through the fire in connexion with the steam-engine, and thence be expelled by the chimney-stalk."

The admission of pure air as above suggested recalls to mind the Spanish proverb, which says,—

> "If the wind reach you through a hole,
> Go, say your prayers and mend your soul."

And as to the mode of extracting foul air, experience has shown that the vitiated air from the different wards will, by a difference of temperature in any ward, as readily rush in to pollute it as that the foul air will pass along the extracting shaft or flue common to all the wards. Why not try to expel the smoke of different room fires by leading the vents into one common chimney? The smoke will not go as we wish, neither will the air. Suppose we have an apartment with only one opening for inlet and outlet, then let us humble our boasted skill and science to the instinct of the humble bee, and say in admiration, "How doth the little busy bee ventilate a colony of 30,000 in one hive?" It is not long ago since we heard of an ill-ventilated free church with several openings for admission and exit, but no fresh air: so the result was that 600 drowsy perishing sinners fell asleep, as related by Dr. Guthrie.

There has as yet been no satisfactory solution of the ventilation problem to suit the artificial habits of the period. In our ordinary dwelling-houses no steps whatever are taken to regulate either the supply of pure air or the exit of vitiated air, but it is probable that our large fireplaces regulate this matter tolerably well. In crowded rooms, however, and hospital wards, where the amount of vitiated air bears a much larger ratio to the cubical contents, the fireplaces might be constructed after the wise sanitary principles of our forefathers, as may be seen in the old baronial halls, where in olden time the wide, lofty fireplaces, lined with bright Dutch tiles, radiated the genial heat around, while the capacious chimney-flue carried away the vitiated air, the supply of external air being admitted from roof and casement. The height of the fireplace gave always a pure stratum of air to breathe, whereas now our modern grates are made so low that even when we sit or lie in bed the lintel of the grate is lower than our heads! By introducing again Mediæval fireplaces, our retrogressive notions may be utilised and improved upon for hospital wards, as surely the science and skill of the period may construct a fireplace to warm and ventilate a ward, say 40 ft. by 20 ft., and 15 ft. high.

The fireplace for such an apartment should have the real character as well as semblance of the old style: say that it be made 6 ft. wide in opening of jambs, and the lintel set 5 ft. high; there should be two or three vents of 1 ft. diameter each, or more if practicable, for smoke and ventilation; the inlets of fresh air to be at ceiling or top sashes of windows. The grate for such a fireplace may be made about 3 ft. high, and its fire-cradle in the form of W made 4 ft. wide, the grate to stand clear from the back and sides of the fireplace, which should be lined round with bright tiles to radiate the heat and cheerful glow of the fire.

The object of the grate having two divisions as in W, is a device for consuming the smoke which will be so far accomplished by either side being supplied with coal alternately,—the bright side burning the smoke of the other. The heat from such a fireplace may be more thoroughly radiated through the room by means of a large tin screen kept bright to reflect or shade the heat as required. This idea of a bright metallic side for fire-screens will draw out the heat of our open fires.

In a room heated by warm air all the air must be hotter than is required for breathing: the solid objects in the room, being colder, are constantly absorbing the vital heat from the bodies of the occupants, while they are breathing the warm debilitating air. It is this condition of things that gives that uncomfortable feeling so universally complained of in all rooms warmed by hot air.

On the other hand, it is the powerful direct radiation that comes from the glowing flames of an open fire that makes it so nearly correspond with the radiation from the sun, and enables it to produce an artificial warmth unequalled for comfort and healthfulness.

Seeing that we must accept an inferior arrangement to maintain a uniform temperature over a large room or ward, I can scarcely see how we can avoid coming directly to the conclusion that we should warm the floor and exterior walls to a temperature equal to that of our bodies, and so prevent the absorption of radiant heat from our bodies by the cold plaster walls. We could thus afford to have cold air for breathing.

The hypocaust of the Romans, which is also well known to the Chinese, for warming floors, and their mode of heating walls, may give some idea how the cold stratum of air that is always found rushing in at every chink could be warmed in the space behind laths and plaster, and under the floor. If this plaster were hung upon iron laths and standards, we should have fire-proof walls, the open space forming a caliduct for heat from the open fire-place to distant parts of the room; and also all extracting flues should be formed in such spaces for carrying away the vitiated air and fumes of burned gas, &c. The admissions and diffusions of fresh may be over hot-water pipes, as required at windows.

JAMES KERR.

OPENING OF AN OIL-CAKE MILL AT BOSTON.

THE opening of new premises of such large proportions as the mill and warehouses just completed for Mr. John C. Simonds, cake manufacturer, of Boston, is an event which is of rare occurrence in this part of the country.

The building has been erected under the superintendence of Mr. W. H. Wheeler, C.E., of Boston. The contractor was Mr. Huddlestone, of Lincoln. Mr. Owen Broughton, of Boston officiated as clerk of the works. The mill is situated in Skirbeck Quarter, a few yards from the Black Sluice. It is thus well placed for transporting products either by railway, sea, or canal.

The building is 200 ft. long, 47 ft. wide, and 60 ft. high, and contains a press-room for four treble sets of oil-presses, cake stores, oil-room, engine and boiler house, and granary-room for 14,000 quarters of seed. The foundations of all the main walls were excavated to the depth of 15 ft., and 6 ft. wide below that level Memel timber piles were driven by a steam pile-driver to a further depth of 15 ft. On the top of the piles was fixed a Memel timber sill, 12 in. square, and covered with two thicknesses of 9 in. by 3 in. deals, on the top of which was put about 1,400 cubic yards of blue lias lime concrete. The quantity of timber used in the foundations was upwards of 8,000 ft. The total weight of bricks, lime, concrete, and sand used in the erection of the building exceed 3,000 tons, upwards of 10,000 ft. of timber in joists and roof, 80 tons of slabs, 360 squares of floor and roof boarding, 4,000 cubic feet of stone, 600 yards of concrete for engine bed, beds of presses, pumps, &c., 40 tons of Yorkshire tooled flags, and about 50 tons of wrought and cast iron (exclusive of columns for carrying the floors). The chimney is 110 ft. high. Inclusive of two residences for the foreman and engineer, about a million bricks have been used in the construction of the buildings. The floors of the mill are supported on balks of timber resting on iron columns. The cost of the building and its fittings will be a large amount.

HOW DO YOU PROVE YOUR PLUMB-RULE?

A TECHNICAL LESSON.

THE following particulars are authentic, and I remember all the parties. I shall condense from memory. The matter in dispute was a brick wall which fell shortly after its erection, the downfall of which, I believe, was accelerated by a downpour of rain. When the builder put in his bill for payment, his client refused to acknowledge any claim. The wall was certainly built, and the wall was certainly down. The client contended that it was badly constructed, and that it was put up in an unworkmanlike manner; the builder, on the other side, was ready to swear and prove that it was erected by competent workmen, and that it was executed in a creditable and workmanlike manner.

The case had to be settled in the law-courts, the builder being the plaintiff. The defendant secured the services of a clever, well-known counsel, who was known to have a knowledge of architecture. When the builder had given his evidence, he was submitted to a severe cross examination, in which his practical knowledge cut a very sorry figure. The particular point of the question turned upon the plumbing of the wall, whether it was truly perpendicular, and whether the plumb-rule was correct. The builder said he was ready to take his oath that the wall was plumb, and that the plumb-rule was quite correct.

"Listen for a moment, gentlemen of the jury," cried the defendant's counsel, "while I put this master-builder to the test. You will be able to judge of his practical acquaintance with his profession from the answer he gives. Well, Mr. Builder, you are ready to swear upon your oath that the wall was plumbed, and the plumb-rule correct?" "Yes." "You are?" "Yes."

"Will you be so good, Mr. Builder, as to turn round and tell those twelve intelligent jurymen in that box how you know that your plumb-rule was correct?" The builder hesitated for a moment, and then replied, "I know it was correct, for my workmen are always careful and particular with their work." "I am not disputing the character you give your workmen," replied the counsel; "I merely ask you to tell the jury how you know that the plumb-rule they worked with was correct." "I know it was correct," repeated the builder, "because it was made the same as all plumb-rules are made, and used by men in the habit of using them." "I must again ask you, Mr. Builder, to be so kind as to tell the jury or me how you are certain that the plumb-rule was true; or, in other words, let us know how you prove your plumb-rule?"

This was a poser.

"Now, Mr. Builder," continued the defendant's counsel, "you have come into court to make a claim against my client: you swear that the wall was built properly plumb, and that it did not tumble down from bad workmanship. I now ask you, as a respectable builder, to just explain to the jury the method of practically constructing and proving a plumb-rule. You are no doubt aware that if a plumb-rule is not correct, the work that it is applied to will not be correct. I am ready to prove that it was not correct, that the wall overhung. Geometrically speaking, it was out of perpendicular: consequently, the work was badly executed, and I deny that you have any claim for payment."

A silence for some minutes reigned, and then the plaintiff made one or two ineffectual attempts at explanation, but got so confused that he completely broke down.

"It is needless, you see, your lordship, and gentlemen of the jury, for me to carry this case much further. I will simply conclude by saying, here is an instance of the deplorable consequences attending rash assertions and wrongful claims. Men are found to come forward to make a claim for what they have no right, or have forfeited, and are ready to fortify their unfair demands by swearing that they know practically what they do not know. Well, gentlemen of the jury, as the master-builder, when in the box, was unable to prove his plumb-rule, perhaps he will not take it amiss from a lawyer to tell him how to practically construct and prove at the same time a plumb-rule, which may be depended upon, for plumbing a straight wall, or any other description of perpendicular work.

Take a piece of board a little more than the proper length, breadth, and thickness which you require. With a pair of compasses strike a circle on its face within a few inches of either end. Plane straight on the edge until the sides of the circles are touched,—repeat on opposite edge. When this is done your piece of board will be of a parallel breadth. Then a line drawn through the centre, with a slit for the cord and an opening for the play of the "bob," will complete your plumb-rule. I am not an architect, gentlemen of the jury, but I believe no practical architect, builder, or workman will say I have not given a practical method for proving a plumb-rule. One word more, gentlemen; I think when a master-builder comes into court and takes it upon himself to swear that his work was properly executed, he ought to be able to give us proof when asked of the workmanlike manner of its accomplishment. I now ask a verdict for my client."

The jury unanimously declared in favour of the defendant, the foreman saying that he himself and his fellow jurors were of opinion that the wall was badly constructed and out of plumb, and that that was the reason of its fall.

It may be asked here, was the counsel for the defendant technically correct in his method of proving a plumb-rule of any length? And it may be further asked, how many master builders, and workmen too, are there at the present hour, who, if called upon suddenly, could practically demonstrate, in proper language, the geometrical construction of a simple plumb-rule or straight-edge. However astounding it may seem, I have come across many workmen who could not, without some thinking and groping, properly set out the egg oval opening, or "bob" hole, in their plumb-rule. Archimedes is reported to have said that if a prop, or position, and a lever, were given to him, he would move the world. Technical knowledge is the prop, the position, and the lever; and, without the ambition of the great Greek mathematician, it will enable a man, at some time or other, to lift himself in the world, and, morally and socially speaking, lift up the world at the same time. Ç.

ORCHARD HOUSES.

THE best form of a villa orchard-house is that of a span roof, having the ends placed due north and south, so that an equal amount of light may be received on the one side as on the other. A span-roofed house receives more light than a lean-to, or any other form, and they are consequently the best adapted for fruits, which can never receive too much of that. As regards dimensions, that is greatly optional. Narrow houses are liable to heat rapidly, and to cool down as suddenly, whilst large houses, having a greater body of air, keep to a greater uniformity, and in this way large houses would seem to be the most preferable. Where no artificial means of heating are at command, whilst plants in small narrow houses are often injured by frosts, those in the wider and larger escape. Large wide houses, however, have this disadvantage, that the air is more stagnant. A fairly proportionate house, and suitable, is one about 15 ft. or 20 ft. wide, having for the lesser sized one a single pathway down the centre, and, for the larger, a 6-ft. bed in the centre, then a 3-ft. path all round, and a border 4 ft. wide on each side. The height of the house need not exceed 10 ft. or 12 ft. in the ridge, with the sides about 5 ft. high. The cheapest style of structure is that adopted by Mr. Rivers, the inventor, being simply some stout oak poles fixed into the ground, 5 ft. high, for the top plate to rest on. These are placed about 10 ft. apart, and the space between boarded up, the top half being hung as a ventilator, sometimes a transparent and sometimes a dark shutter. The roof is formed of strong sash-bars, 1½ in. by 4½ in. deep, placed about 15 in. or 18 in. apart, in which the glass is fixed,—no rafters or sashes being used. Ventilation is provided by an opening just under the top of the ridge at either end, and at the sides; and the *Farmer*, which so describes it, says it is wonderful to see the results. Houses such as these can be erected very cheaply, for at least 20s. per ft.,—that is, a house 60 ft. long would cost 60*l*. One, however, something a trifle better than this is recommended. First, let the house have a good brick or stone foundation, say, 18 in. out of the ground, on which fix the batten or wall plate; then sashes, 3½ ft. by 5 ft., hung on central pivots for ventilation, the top plate being thus 5 ft. from the ground. At every 10 ft., strong rafters, 2 in. by 6 in., should be fixed to a centre ridge plate, and connected together in their middle by a strong bar, about 12 in. from the ridge on either side; another cross-bar, the same depth as the rafters, should be placed on which to fix the scob-bars, the space between this and the ridge to be for ventilation, by covering it with the common flap-board fixed to the ridge; the scob-bars, about 1 in. by 1½ in., should be fixed to receive the glass, 12 in. or 14 in. wide. The glazing would thus be continuous throughout, and very light and strong. The ventilation being from the side sashes and the top flap at the ridge, all of these could be opened by simultaneous movement. A house of this sort may be as much ornamented as fancy pleases, by mouldings on the ridge ends, &c., by painting the rafters and other parts of a lively blue, and the sash-bars white, &c., and the cost of such a house, 50 ft. long, would not exceed 100*l*. The enjoyment to be derived is regarded as worth double the money.

PROPOSED MASONIC HALL FOR LINCOLN.

MASONIC halls are springing up throughout the country. The design for the proposed new Masonic Hall for Lincoln, to be erected on the site recently purchased on the north side of Newland, has been decided on. The building will be commenced in the spring, and, in addition to the rooms to be used for Masonic purposes, will comprise a large assembly-room, or concert-hall, and other rooms and offices. The designs have been prepared by Brother W. Watkins, architect, of that city. The ground-floor plan contains two entrances, each 9 ft. wide. Between them is a room 24 ft. square, to be used for sales or small meetings. Immediately behind this room, and approached from the right-hand entrance, is the large open staircase leading to the Masonic departments, which occupy the whole of the front or the first story. Immediately behind the sale-room, and approached from the left-hand entrance (which will be the chief entrance to the public assembly-room), are cloak-rooms. Behind these are staircases leading to the galleries, which extend round three sides of the large assembly-room. This hall, which is 78 ft. long, 32 ft. wide, and 25 ft. high, has an orchestra at the extreme end, 16 ft. wide, and 13 ft. deep, to right and left of which are two green-rooms. Exclusive of the orchestra, the hall will seat 700 persons. The principal staircase, approached from the right-hand entrance, leads to the Masonic lodge, which consists of a reception-room, 24 ft. by 18 ft.; a porchway leading to the lodge-room, which latter is 36 ft. by 24 ft., and 22 ft. high in the centre; and a preparation-room, together with stores for lodge furniture, &c. The building is designed in the Geometric style of Gothic architecture, and is intended (on certain conditions) to be a memorial of the late Doctor Oliver; and, with that view, provision is made in the centre of the front for a life-size statue of him, which will be placed upon a pedestal supported by coupled polished granite columns, and surmounted by an ornamental traceried canopy. The front will be 45 ft. wide, and 50 ft. high from the pavement to the apex of the centre gable, which will be surmounted with the life-size figure of St. John. It is to be regretted that the design is for merely a front.

FROM IRELAND.

Dromore.—The Cathedral Church of Christ the Redeemer, at Dromore, has been re-opened, after extensive additions and alterations. About 2,000*l*. have been expended upon it, the design having been given by Mr. Thomas Drew, architect; the contractor being Mr. Walter Doolin, of Dublin. The church at Dromore stands upon a very ancient site, but it possesses no merits in an architectural point of view. In the additions which have been now made and are in contemplation in the future, a difficult task has been experienced, viz.—to re-model an unsatisfactory building, hampered where extension was wanted by interments, without, at the same time, destroying historical associations which the several portions of the structure bore. This has been effected by taking down the eastern end of the old church, and terminating it with a semicircular apse, lighted by seven pointed windows, and which is intended as a memorial to Bishop Jeremy Taylor, and will be known as the "Taylor apse." In the angle, formed by this portion of the church and the transept alluded to, has been made the principal addition, in the form of

an aisle, 25 ft. wide, which embraces within it the transept, and will consequently be known as the "Percy aisle." On the east and north of this again are narrow aisles, opening into it with pointed arches, and it is intended that this aisle, with its north aisle, should be ultimately extended towards the west, so forming an addition of considerably greater area than that of the old church, and opening into it along its entire length, with an arcade of arches springing from carved columns. Although quite impracticable to transform the building into one of a cathedral aspect, it has not been lost sight of that it still, at least nominally, possesses a chapter and dean, and that at some future date it might possibly be the pro-cathedral of a separate bishopric. The eastern end of the church, for two bays in length, has been treated distinctively as a choir, terminating westward in a square pier, the intermediate pier being of coupled columns with sculptured capitals. The roof of the choir is treated distinctively, being cusped in section, and sheeted with stained timber. The new roofs of both the new and old building are high in pitch, open-timbered, and plastered between the rafters, having tie-beams and king-posts moulded after the manner of columns. The former stalls of the capitular body are now arranged on each side of the choir, and terminated with a low stone wall or curb to the raised floor. The building is still encumbered, from sheer necessity, with unsightly and inconvenient galleries in the "Percy aisle" and nave, the removal of which is urgently demanded. This done, and the whole contemplated additions carried out, Dromore Church or "Cathedral" will be a building of considerable area. The memorial chancel rails are by Messrs. J. Redman, of Coventry; the floor is laid throughout with encaustic tiles by Messrs. Shaw, through their agent, Mrs. Riddel & Co., of Belfast. A lantern, by the Messrs. Skidman, the gift of the rector, is placed below the steps leading into the choir. Two windows of grisaille work, by Messrs. Wailes, of Newcastle, have been placed in the north aisle to the memory of various members of the family of Mr. T. Stott, now of Ballymoney, but formerly of Dromore; while a nook near the eastern porch contains four memorial windows, by Messrs. Heaton, Butler, & Bayne, of Coventgarden, representing Faith, Hope, Charity, and Justice. Other windows have been promised.

INUNDATION OF ROME.

THE Tiber entered Rome just before the King, and has done enormous damage. A correspondent on the spot writes to us:—

Rome at this moment is in a state of intense excitement. The Tiber has risen against it, and now occupies a good half of the city; the Corso itself and Piazza del Popolo being several feet deep in the water; the Via Condotti up to the Albergo d'Alemagna, the Via Ripetta and quarters of Trastevere, and more especially the Ghetto, both quarters densely populated by the poorer classes, are in the worst case of all. The country around is flooded from the breaking down of dykes and other disasters, and indeed it is impossible at present to ascertain the extent of the disaster and the loss of property, as it is a far higher flood than the celebrated one of 1846. The whole place is in a state of uproar, both yesterday and to-day. There is such a dearth of boats of any kind, and the water is so deep that carriages cannot venture far into the flooded streets, and the difficulty is to convey food and assistance to the imprisoned inhabitants. The Government is sending about high wagons, guarded by soldiers, and laden with bread. The King sent a return telegram, on hearing of the disaster, to place 20,000f. from him in assisting the sufferers; but now also some accident has happened on the railways, and there has been no mail in from the north of Italy or Civita Vecchia for five days; so we are almost in a state of siege. From the terraces of the Pincian Hill the sight is extraordinary. You can see down the Condotti, looking like a street in Venice,—and would that they could have the gondolas also; the Piazza del Popolo looks, from its shape, obelisk, and fountains, as if it had been intended to be filled with water, as it now is a basin; and beyond, in the Campagna, extends a large tract of water, like a lake, dotted with the roofs of houses, the highest floors alone visible, and tops of trees. The water is, they say, receding now a little; and if a strong *tramontane* wind would blow, instead of this *scirrocco*, they say the water would subside; but I saw little difference again this afternoon. All houses are now lighting up their windows, in the inundated parts, and we are going out to see the effect. It will be some time before accurate accounts of the disaster can be obtained; but it is certain that they can scarcely, as yet, be exaggerated. The King has since left 200,000f., in addition to his first gift. He has been received with the greatest excitement and delight. "Come back soon, Emmanuel!" was the cry when he left. Those who superstitiously would connect the doings of the King and the Inundation are met by the fact that the lightning which heralded it struck the Pope's chapel in the Vatican.

THE INTERNATIONAL EXHIBITION, 1871.

IT is surprising to find how little is known out of doors concerning the approaching Exhibition. Nearly every week we receive letters of inquiry, and yet, as we are reminded, the rules have been announced and advertised since August, 1869, and many thousand notices have been sent direct to exhibitors at former Exhibitions. Let us repeat to two inquirers whose letters are now before us that all applications should be addressed to Col. Scott, Kensington Gore, and that exhibited articles will be protected by the Act of 1870.

Objection is made, so far as models of inventions and delicate machinery are concerned, to the requirement that works must be sent in by February, though the public will not be admitted till May; but the authorities say it is necessary. The judges for Fine Arts have been announced, and the list of judges in other departments is now, we believe, settled.

One of our correspondents urges that the Commissioners should light up the Exhibition, so that it might be open on certain evenings for the advantage of those who are engaged during the day. We do not know any valid reason why they should not do so.

FAIRFORD CHURCH: FAIRFORD WINDOWS.

"THE TAMES OF FAIRFORD."

AT a meeting of the British Archæological Association on the 11th, Mr. H. F. Holt read a paper on this subject. First giving a brief notice of the claims of Saxon Fairford in an archæological, historical, and artistic sense combined, the object of the paper was declared to be, to prove:—1st. That John Tame did *not* acquire the painted glass in 1492, or at any other time, by conquest, piracy, or purchase; 2nd. That he did *not* found Fairford Church, or dedicate it to the Virgin Mary; 3rd. That he did *not* even rebuild the church, or any part of it; 4th. That he did not purchase the manor of Fairford from Henry VII.; 5th. That he never had anything whatever to do with the painted windows, and never even contemplated their erection; and, lastly, that the windows were not ordered until after Midsummer, 1500, and were erected not later than 1505. These propositions were supported by direct reference to original documents, which seem to have never been previously noticed, consisting among others of the original wills of John Tame; Sir Edmund Tame, knight; his son, Sir Edmund; and other members of the family. In other words, the old tale of John Tame having seized the glass in 1492, built Fairford Church to receive it, and dedicating it to the Virgin Mary, was disproved.

The effect of the paper being to prove the date of the glass to be later than hitherto imagined, it will be regarded as important by those who attribute it to Albert Dürer.

The history of the Tame family was related, and John Tame's first connexion with Fairford was declared to be 1480 (20 Edward IV). The romantic history of the Manor of Fairford was given from 1460 to 1489, the lordship thereof having, during that period, been successively held by Richard, 5th Earl of Warwick, in right of his wife, the Lady Anne Beauchamp; the Duke of Clarence, supposed to have ended his days in a butt of Malmsey; Richard, Duke of Gloucester, afterwards Richard III.; and, on his decease, the widowed and childless Countess of Warwick. An account of the circumstances under which the Manor was vested in the Countess, and afterwards conveyed by her to Henry VII. in 1489, was also given. A statement then followed to show that Fairford Church was rebuilt on an enlarged scale by the ecclesiastical communities of Worcester and of Tewkesbury, between the years 1490 and 1495, and that John Tame had nothing whatever to do with this rebuilding; that John Tame's connexion with the church was distinctly pointed out and defined by his will, dated the 28th of January, 1496, and confirmed on the 3rd of May, 1500, five days before his decease, from which it appeared that instead of *founding* the church, and dedicating it to the Virgin Mary, he founded a *chantry* in the north chapel of the church, dedicated to the Virgin. Details of his will were given in support of Mr. Holt's views, who then proceeded to show that the painted glass windows were erected at the sole expense of Edward Tame, the son of John, and fortified his views by reference to the donor's will, and other collateral circumstances.

Here, so far as the church and windows were concerned, the observations of Mr. Holt concluded; he having, as he submitted, made good the truth of each of his before-mentioned propositions, which, if admitted, would be found to have an important bearing in considering the much-disputed question as to the artist who painted the windows, and the school of art to which they belong.

Mr. Holt continued his paper by giving a statement of the salient points in Tames's history, showing the date and circumstances of his knighthood, and the hitherto overlooked fact that on the 26th of August, 1520, King Henry VIII. and his Court arrived at Fairford, and remained there a week, as the guests of Sir Edmund Tame; as well as that, during the royal stay, his Majesty conferred upon Sir Edmund a signal and unprecedented mark of his royal favour, by bestowing upon him a shield of arms, "composed of the supporters of the Royal Arms of England, the crowned lion and griffin."

BUILT TO SELL.

A GLASGOW case of this kind has just occurred. Messrs. D. & R. Law were building premises at Belmont Crescent, and had reached the fourth story, when the whole affair collapsed into rubbish, killing six persons, and seriously injuring five others. Messrs. Law were not themselves builders, but their father, a shipowner, had once been a builder, and they had confidence in their foreman. They feued the ground from a Glasgow banking company, to whom it belonged, and who knew well that it was made ground, raised on a slope, with 33 ft. in depth of forced earth at one corner; and the bank advanced money to Messrs. Law as they went on, an agent, in whom the bank had confidence, "coming and going," and certifying to the doing of the work (and the public) from story to story, week by week, as it rose, like a mushroom. No architect had anything to do with the matter, with which, in truth, no builder either seems to have had to do. The third story had been "certified," and the fourth was in progress, when the card structure collapsed; and for the event Messrs. David Law, sen., and David Law, jun., were tried before a jury, who have decided that Mr. David Law, sen., is "not guilty," and that the charge against Mr. David Law, jun., is "not proven."

BROKEN IRON PIPES.

SIR,—The only sure cure for the nuisance referred to in your last, is to put new pipes.

D. M.

THE INSTITUTE AND THE SURVEYORSHIP OF BRIDEWELL AND BETHLEHEM HOSPITALS.

SIR,—I desire, with your permission, to put a question to the Council of the Institute, through your pages, upon a subject of considerable importance to the profession. I take this course of addressing you publicly in preference to asking the question privately of the Council, or at an ordinary meeting of the Institute, in consequence of the importance and public nature of the subject, which, I think, deserves wider recognition than could be possibly obtained were I to introduce the matter at the very scantily-attended meetings which are held in Conduit-street.

The Council of the Institute issued some time since a paper of rules on professional charges, in which the various payments for different kinds of services are defined with great accuracy. In this document it is stated that the *minimum*

commission payable for preparing drawings and specification, and superintendence is 5 per cent. upon the net cost of the work. In the case of alterations to old buildings, or the designing and superintendence of furniture, fittings, sculpture, stained glass, or other works of a similar kind, a higher commission may be charged; but it was clearly the intention of the framers of these rules that 5 per cent. should be the minimum charge for an architect's services for designing and superintendence. Now, the question I wish to ask the Council is this,—Are these rules, which were, I suppose, drawn up by the governing body of the Institute, and are presumably intended to regulate the general practice to promote the welfare and define the position of the profession, obligatory upon the Fellows of the Institute, or are they not?

My reason for asking the question is that I observe that more than one Fellow of the Institute is a candidate for the appointment of surveyor to Bridewell and Bethlehem Hospitals, and that in a memorandum of the duties of the surveyor issued by the governors for the information of candidates, it is stipulated that, should any buildings be erected under the superintendence of the surveyor exceeding 2,000*l.* in value, he shall be paid a commission of 2½ per cent. upon the cost. If the rules of the Institute are binding upon its members, it would appear that a Fellow—I will not say an Associate, because an Associate has no share in the government of the Institute, and his obligations to the Institute are less rigorously defined,—but a Fellow certainly cannot consistently seek an appointment in which the rules of the Institute are set at nought. Into the merits of the question of payment by per-centage I am not disposed to enter; nor is it, I think, at all necessary that I should do so: there is much to be said both for and against the system, but as long as the Institute countenances it, and makes rules for its members based upon that system, it seems only common sense and common honesty that the members of the Institute should endeavour to carry out those rules in their own practice, and not, while seeking to impose them upon others, to throw them aside whenever their observance becomes inconvenient.

There was an old custom, which existed until very recently, and took place at an inn at Highgate, where the neophyte swore upon a ram's horn to observe a variety of conditions, and to abjure many things, in a long and absurd jurat, which ended with the remarkable provision,—"unless you choose otherwise." It would seem, from the conduct of some Fellows of the Institute, that they qualify the obligations they contract towards that body with some such addendum as that which formerly attended the ceremony of being sworn at Highgate.

CIVIS.

THE CONSISTENCY OF THE INSTITUTE.

SIR,—Professor Donaldson seems to take needless offence at the letter of "F. R. I. B. A.," in yours of 31st ult. He says, "I know not whether the writer considers it consistent with the loyal allegiance which every one owes to a public body of which he is a member, to cast discredit upon its regulations." I certainly think such conduct, if indulged in, most inconsistent, and, moreover deserving of prompt and rigorous action on the part of the council. But in the present instance, is not the learned Professor himself more amenable to the charge than "F. R. I. B. A.?" The latter has not said a word against the Institute rules, whereas the Professor has recently pronounced one of them to be "incapable of proof, illegal, and unreasonable." It was well to observe that he was in a minority at the time, but his opinion carries more weight than that of most men, and was calculated to do much mischief.

Surely if the rules were drawn up in the careful and conscientious manner, he says, the more reason why an important one of them should not be denounced on such slight grounds as the recent decision of the Court of Exchequer, which dealt with a very peculiar case. As the Professor very properly says, "previous decisions as to law are overruled every term." It is quite possible, then, that this apparently adverse decision may yet be reversed or superseded; and in the meantime would it not be more becoming in such an influential member and office-bearer of the Institute to stand by its published views (in which it has been unanimously confirmed by the provincial societies), than to join with the *Times*, Mr. Ayrton, and Mr. Baron Bramwell, in condemning them? It is well known that the 5 per cent. charge, and, indeed, the whole system of payment by per-centage, was at one time denounced as illegal in the courts; but it has continued, nevertheless, and is now seldom, if ever questioned.

If one rule on examination turns out to be "illegal and unreasonable," all may be so, and under such circumstances it is manifestly absurd to quote any as authoritative. One-half of the rule referring to property in the drawings being set aside, why should the other, which binds the architect to supply two copies for one fee, remain in force? It is especially unfair that those which relate to architects' *duties* should be rigidly enforced, while those that have regard to his *rights* are weakly surrendered. There are many good reasons to be adduced in favour of the architect furnishing quantities at a fair rate, the Institute rule notwithstanding, and the practice is very general in the north of England. Architects are expected to understand "the measurement and valuation of artificers' work," and if so, why should they be debarred from practising it? Indeed, it might be worth while to ask Mr. Ouvry, or some higher authority, whether this rule be not illegal also, coming under the category of "contracts in restraint of trade."

I yield to none in honest loyalty to the Institute, and in anxiety to see it take its proper place as the chief governing and representative body of the profession. This will never be the case so long as its members are not ashamed publicly to contravene its rules, and such a line of conduct is not deemed worthy of notice by the Council. I am very far from being singular in these views, many members having expressed the same, and numerous other active and respectable architects declining to join the Institute on the ground of its inefficiency. I hope, however, some day to see more useful practical measures adopted to secure "uniformity and respectability of practice;" but in this hope many think I am over-sanguine.

WM. FOGERTY.

OVERHANGING ROOFS AND CORNICES.

SIR,—I crave your permission to suggest that overhanging roofs or cornices should not be allowed in crowded thoroughfares. It seems to me that the district surveyor should have power to stop all such merely ornamental, but useless, encroachments. They fall now and then, and drip continuously, rendering the footway unpleasant, and even dangerous to passengers.

A. H.

THE LONDON BUILDERS AND THE LAW COURTS.

A DEPUTATION of London builders, consisting of Messrs. H. Lee, Plucknett, Hannen, Johnson, Trollope, and T. Lucas, waited by appointment on Mr. Ayrton, at the Office of Works, on Saturday, the 7th, in reference to the proposed conditions of contract, which had been objected to. These were generally modified, but on the principal supposed points of difference it appeared that the Commissioner and the builders were already quite agreed in substance, and the only question was whether the wording of the conditions carried out the intentions of the Commissioner and the builders. The legal adviser of the builders and the legal adviser of the Commissioner appeared not to coincide on the legal phraseology necessary, and it was left to these gentlemen to confer further together. The deputation expressed their thanks to the Commissioner for his patience and courtesy, and withdrew.

We have before us the particulars of the changes that were made, but their publication now might prejudice the question.

THE ARCHITECTURAL ALLIANCE.

A COPY of the following letter has been sent to the honorary secretaries of the several societies forming the "Alliance:"—

"In issuing the report of the proceedings at the meeting of the Alliance held in June last, I beg to call your attention to two or three points in reference thereto.

Although the recent legal decision may be considered almost, if not quite, to set at rest the question as to the delivery of the plans by the architect when the works are not carried out, the proprietorship of the drawings when the works are executed is still an open question. It would be of great value if you can obtain from your members any decision upon this subject that may have occurred in the course of their practice.

You will perceive that the question of architectural examinations occupied considerable attention at the meeting, and resulted in two resolutions being adopted. The subject is an important one, especially to the younger members of the profession, and the establishment of provincial examinations would no doubt stimulate many who would otherwise be deterred if their presence in London were needed. It would strengthen the application to the Institute if you could ascertain approximately the number of your members who would be likely to offer themselves for examination, or are, at any rate, favourable to the scheme. I shall be happy to procure any information you may need, so far as lies in my power. The establishment of classes for the preparation or assistance of students would be a great incentive. Such classes have been established by the London Architectural Association, and with much success.

It is intended that an Exhibition of Architectural Drawings shall be held in the International Exhibition, to open on the 1st May, 1871. As the Architectural Exhibition Society is now dissolved, this will be the only means of exhibiting architectural drawings; and as it is believed the architecture of other countries will be well represented, it is hoped that England may maintain its own in this respect. All drawings intended for exhibition must be sent to the Exhibition Building, South Kensington, W., not later than 22nd February next, but application should at once be made to the secretary.

In his opening address for the present session, the President of the Royal Institute of British Architects suggested the desirability of the amalgamation of the Alliance and the other architectural societies with the Institute. As far as the connexion of the delegates and members of the societies with the Institute is concerned, this would, no doubt, be most desirable, in order to make the Institute the recognised body of British architects; but as the Alliance is a representative body, and it can hardly be proposed to abolish the country societies, it has great advantages in ascertaining the views of the several societies comprised in it, and through them of architects generally, which could not be so easily obtained from individual members through the Institute alone. It also has opportunities of aiding the Institute (as, for example, in the establishment of local examinations) and of exerting an outside pressure that will be of value to that body. It is therefore hoped that the resolution inviting some members of the Council to be present at the next meeting of the Alliance will be accepted; and that the two societies may continue to work, each in its own sphere, but for the common good of the profession.

To make the Alliance answer its full purpose, it is most necessary that it should be in a position to obtain directly the experience of the whole, or the greater part, of the architects practising in the United Kingdom, but as many of these live at a distance from the provincial architectural societies, they are not represented. As, however, there are archæological societies in almost every county or diocese, and most of these include the principal local architects, I purpose ascertaining their names, and suggesting the formation of a Professional Architectural Committee or Section, for practising architects and students only; I shall be obliged if you will forward me the names of any such societies in your neighbourhood. I should be also thankful for any suggestions towards the accomplishment of this object. There can be no doubt that the Alliance has been found of value, and it must be borne in mind that your assistance is required in bringing to its notice those occasional subjects which arise affecting the profession, and also that the Alliance is still in its infancy; but the scheme having been fairly organised, it would be a great pity to allow it to drop for want of proper support from the allied societies.

The annual meeting will most probably be held in June next year, at which we shall hope to receive your delegates; due notice will, however, be sent. I shall feel obliged by any communications or suggestions for submission to the meeting being sent to me, not later than the middle of May.

J. DOUGLASS MATHEWS, Hon. Sec."

ARBITRATION *v.* FIST IN THE WORKSHOP.

SIR,—Men who denounce fratricidal war are invariably ready for a fight, on a slight offence or an affrontive word; yet working men have to learn it does not decide right. I have seen shopmates batter each other: invariably the bully triumphs. We adopted a plan to stop these scenes. The instant a man was struck by a shopmate he was to inform the oldest man, who called us together. We had only one case to try: a fine of 10s. was inflicted, with an intimation of its being doubled if repeated. Nothing of this kind has occurred since among the men. The boys have an occasional *turn up;* the foreman is umpire for them, and sometimes thrashes both.

R. T.

UXBRIDGE UNION: NEW INFIRMARY.

CONSIDERABLE alterations and additions have been in progress at the above during the last few months, under the superintendence of Mr. C. J. Shoppee, architect. The accommodation hitherto provided having been for some time past felt to be insufficient, the guardians decided on erecting a new infirmary for males, in addition to altering the old infirmary (which formerly served for both sexes) for females. Mr. G. E. Kearley was the contractor for this portion of the works, and for the new boundary walls.

A new ward for able-bodied men has also been erected, for which Mr. F. Taylor was the contractor. The stoves and heating apparatus have been provided by Messrs. May. Moule's earth-closet system has been adopted throughout. Mr. Collett was clerk of the works.

Thames Piers.—It is understood that a new pier is to be formed near Lambeth Palace, in the place of the old one which was moored near Lambeth Bridge, and recently removed.

THE SURVEYORSHIP OF BETHLEHEM HOSPITAL.

THE governors of Bridewell and Bethlehem Hospitals are about to appoint a surveyor. They offer a salary of 250*l.* a year for the discharge of multifarious duties, and in addition a commission of 2½ per cent. upon the cost of new buildings erected under his superintendence, provided the cost of the building so erected be 2,000*l.* and upwards. Much dissatisfaction is of course expressed by architects with respect to these terms, but the governors nevertheless, we dare say, have plenty of candidates to choose from, so singular is the condition of the profession. The tendency of such proceedings on the part of public bodies is necessarily to damage it still further.

VARIORUM.

THE (American) *Manufacturer and Builder* (Sampson Low & Co.) is publishing in its monthly issues "The History of Art and Æsthetics," translated from the French of M. Viollet le Duc by Mr. P. B. Wight, architect. ——The current number of the *Art-Journal* includes an engraving of "America" by Mr. John Bell, a group now set up as part of the Albert Memorial in Hyde Park. It is to be hoped that the various sculptors who are executing groups for the memorial are working in subordination and under one general direction. If it be not so, we may have to regret incongruities and want of balance. Mr. Bell's group is evidently the result of much thought. We trust, however, the figure of Canada in reality is better proportioned than in the engraving. Haddon Hall is the subject treated of and illustrated in the series headed Stately Homes of England. The writer is too true a brother of the angle to omit reference to the pleasantest little inn in England, "The Peacock" at Rowsley. Oh, for summer weather, and a week in that quiet haven! ——The half-timber houses of Herefordshire are thus spoken of in "Annals of a Border County" in the January number of *Fraser:* "Picturesqueness must rather be sought in the numerous timbered houses, conspicuous in black and white, which form one of the specialties of the county. Weobley and Pembridge are collections of these quaint dwellings, whose projecting gables, heavy barge-boards, and plastered wattling carry us back to a time when oak was plentiful and labour cheap. The durability of the materials employed is marvellous. There are extant houses built in the early part of the fifteenth century, and still, so far as their timber is concerned, evincing no signs of decay. The axe glints from the surface of their massive beams as from a close-grained rock, and even fire itself can make little impression upon wood seasoned by the lapse of centuries. Dineley's sketches, reproduced in fac-simile in the very curious volumes lately published by the Camden Society, show us what the county has lost through the spirit of improvement rife since his time. But we still have in China or Cheney Court an almost perfect example of the domestic architecture of the Tudor era; and in Brinsop Court, the moated grange of the Dansey family, are specimens of native oak such as this degenerate age could not produce. Attached to each house is a dismantled chapel, and the first-named has a series of panel paintings, representing the Sibyls, of considerable interest. But the local style was not confined to dwelling-houses. It had its fullest development in the Market-hall or Butter Cross of each little town, a building which in most instances has suffered largely from the Philistinism of its custodians." ——The January part of the *People's Magazine* (Society for Promoting Christian Knowledge) includes, with much interesting reading, an illustrated account of the Fell Railway over Mont Cenis, a remarkable undertaking.

Miscellanea.

Busts of Deceased Statesmen for Guildhall, London.—A bust of the late Lord Derby has just been unveiled in Guildhall. It is the work of Mr. Noble. It is placed in a corridor near the Aldermen's Chamber, immediately beneath the portrait of General Sir W. F. Williams, of Kars, and close to the bust of the lateearl's great rival, Lord Palmerston, and of Lord Canning, the first Viceroy of India. It has cost the Corporation about 250*l.*, and was ordered about a year since. A bust of Lord Brougham will likewise be unveiled in a short time.

The Condition of "Wapping Island."—The *Standard*, commenting on the account we gave of a visit to this place, last week, says,—"What is to be done with 'Wapping Island?' Rowland Hill once preached to 'Wapping sinners,' and the species would seem to be far from extinct. The misery, we fear, has increased. Since this visit was paid from which we have derived our description, the local authorities have been at work. Nine houses in one court have been declared unfit for human habitation, the whole of the families in them have been turned out, and the doors and lower windows boarded up. The ejected families, 'fevered and plague-stricken as they are,' have betaken themselves to an adjacent court, where disease is also rampant, and where the dead and the dying of the poor Irish 'are waked together.' Outside the confines of this island, we are told, there are other lanes and alleys quite as bad as those previously referred to. English or Irish, good or bad, it is neither fit nor safe that human beings should thus herd and fester together. Well may it be said that places like these 'require instant parochial and Government inspection.' Local mortuary houses are 'an actual necessity,' in order to stop the progress of contagion. Sanitary inspection must not merely be frequent, it must be 'daily.' 'Sisters of Mercy' and 'Puseyites' are going about on angels' errands among these suffering creatures, but the tide of misery bears down all the agency yet employed. This dreadful picture is repeated in other parts of London, in varying degrees of light and shade."

The Romford Surveyorship: Shabby Treatment.—At a recent meeting of the Local Board of Health, a resolution was passed reducing the surveyor's salary to 120*l.* per annum, and time was given for him to consider whether or not he would accept that remuneration. The Surveyor now stated that he accepted the salary, but did so under compulsion; as, when he took the office, it was upon the understanding that he would receive 160*l.* per annum; and therefore he considered the action of the board was a breach of faith. He also wished to inform the board that now the salary was reduced he should expect to be paid regularly; at the present time the board owing him three quarters' salary, and he being obliged to frequently trespass upon his private means to pay accounts of the board. Mr. Bird thought the board were not justified in calling upon the surveyor to expend money for their purposes: he ought to be supplied with money so that he would not have occasion to trespass upon his own resources. Mr. Idle expressed a similar opinion.

The Nine Hours' Movement. — At a recent meeting of the house carpenters and joiners of Newcastle and Gateshead, the following resolution was adopted:—

"That we should have a reduction in the hours of labour from fifty-five and a half to fifty hours per week; to work nine hours for the first five days, and five hours on Saturday."

The following alterations are also proposed in the working code of rules:—

"Rule 4, clause 2, all men paid 6d. per hour shall be paid 6¾d., or, working by the day, 28s. per week; rule 5 to alter the hours of work; rule 7, to be paid overtime,—first four hours, 8¾d. per hour; and from 9 p.m. to 6 a.m., 9½d. per hour."

We understand that the masters have received official intimation of these intended alterations, the term of notice, in accordance with the rules of the trade, extending to the 1st of April next.

Gallery of Illustration.—Mr. and Mrs. German Reed's new entertainment, to be produced on Monday, the 23rd inst., is called "A Sensation Novel," and in it the characters and combination of incidents in this class of literature are satirised. Mr. W. S. Gilbert is the author. The "Musical Notes" are by Mr. German Reed; the "Vignettes" by Mr. and Mrs. Reed, Miss Fanny Holland, Mr. Corney Grain, and Mr. Arthur Cecil; and the "Frontispiece" is by Mr. John O'Connor.

Working Men's Universities.—While the project of founding at Liverpool a college of science, at a cost of 50,000*l.*, is still talked of, a scarcely less important undertaking, on a lower scale, has got into successful operation. This consists in a number of classes opened in different parts of Liverpool for the practical instruction of operatives in building, naval architecture, &c., and all mechanical arts, as well as in the science of chemistry.

Bradford Waterworks: Bursting of the Low-Level Conduit.—The supply of water to Bradford by the low-level service is at present interrupted, owing to the bursting, a few days ago, of the main conduit at Morton Banks. The course of the conduit here is along the face of the hill, parallel to the Leeds and Liverpool canal, but at a considerably greater elevation. At the place where the accident happened the water is carried across a small valley by an aqueduct of stonework about 80 yards in length, pierced by an arch to allow of the passage of a rill which runs at the bottom of the hollow. The dimensions of the conduit internally are about 4 ft. by 3 ft. 6 in. It appears from an examination which has since been made, that there was a leak in the masonry on the south-west or low side, and the action of the frost had caused it to give way. The stone work has gone down for a space of about 40 yards, and the force which has been brought to bear on the side of the conduit may be judged from the fact that at least 10 ft. of the solid wall about the centre of the aqueduct has been pushed out as a door might be thrown back on its hinges. The work of restoration is now, we believe, complete.

A Fatal Kitchen-Boiler Explosion in the North.—A distressing accident has occurred at Middlesbrough, attended with fatal results. The kitchen boiler in the house of Mr. Wilson, Cromwell-terrace, Newport-road, exploded with dreadful effect. A servant-girl was in the cellar kitchen when the boiler, which was fixed behind the fireplace, exploded. The thigh of the poor girl was broken, her face, hands, arms, and shoulders frightfully scalded, burned, and mutilated; the back of the boiler was driven through the wall into the kitchen of an adjoining house, where it lay upon the floor, torn up and twisted like a piece of paper; the bricks upon each side and under the fireplace were riven from their places, the ceiling shaken down, the windows smashed, and the doors displaced. The poor girl was conveyed to the infirmary, and there expired, in great agony, three hours afterwards. The inquest jury returned a verdict of "Accidental death," and recommended that in all similar boilers safety-valves should be fixed.

Winchester New Town-hall. — The designs, which are forty-six in number, have been arranged, for the inspection of the committee and to facilitate their decision, in the large room at the Corn Exchange. It is a difficult task the committee have before them; for though some few of the competing architects have evidently mistaken the wants of the city, and have subordinated what should have been leading features, the great majority of the designs display careful thought and effective treatment. The collective labour must have been immense. Gothic is the prevailing style adopted by the competitors.

The late Herr Ainmuller.—The death of this artist at Munich is announced. He has long been honourably connected with the stained glass works there, and designed, amongst many others, windows in Glasgow Cathedral and St. Paul's, London. We have an agreeable recollection of an examination of the works in Mr. Ainmüller's company a few years ago. He was about sixty-four years of age when he died; and was held in much esteem as an artist.

Society for the Encouragement of the Fine Arts.—The first *conversazione* of the season will be held on Thursday, the 19th inst. at the Suffolk-street Gallery; and on the 26th there will be a lecture by Dr. Zeriffi on "Prehistoric Art." The committee has issued a capital programme, giving promise of many interesting evenings, and have abolished the entrance fee. The society's own rooms are at No. 9, Conduit-street.

Mr. Munro, Sculptor.—The death is announced of Mr. Alexander Munro, the sculptor. He had been in such bad health for some time that his recovery was generally regarded as hopeless. He died at Cannes on the 1st inst., aged 45

Hope for Herne Bay.—The designs for the new promenade pier are now on view at the Dolphin Hotel. The structure is to be composed entirely of iron. We hear that the estimated cost is 18,000*l.*

St. Olave's, Hart-street.—This interesting old church is about to be restored. It is now cleared out of all the old pewing, and is well worth a visit.